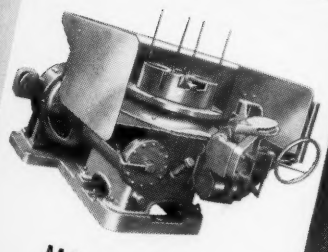
MARCH 1952

WIRE AND WIRE PRODUCTS



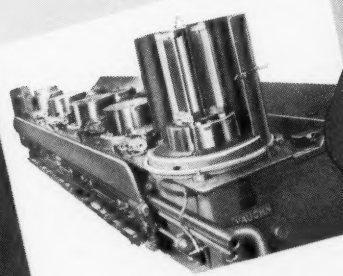
MOTOBLOC®

Need more tons output of wire per month?

you can get it with modern

Vaughn®

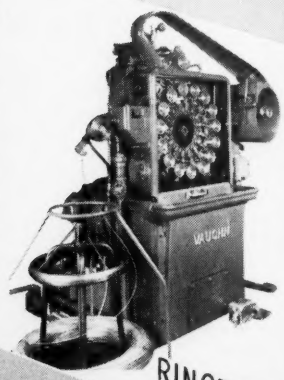
Wire Drawing Machinery



MOTOBLOX®

without increasing floor space

without increasing personnel



RINGBLOX®

Yes, the *extra* performance offered by today's Vaughn machines in place of your older wire drawing equipment can enable you to meet heavier production schedules and increase your profits—without enlarging plant space or adding to the workers employed.

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COMPLETE COLD DRAWING EQUIPMENT . . . Continuous or Single Hole . . . for the Largest Bars and Tubes . . . for the Smallest Wire . . . Ferrous, Non-Ferrous Materials or their Alloys.

OFFICIAL PUBLICATION OF THE WIRE ASSOCIATION

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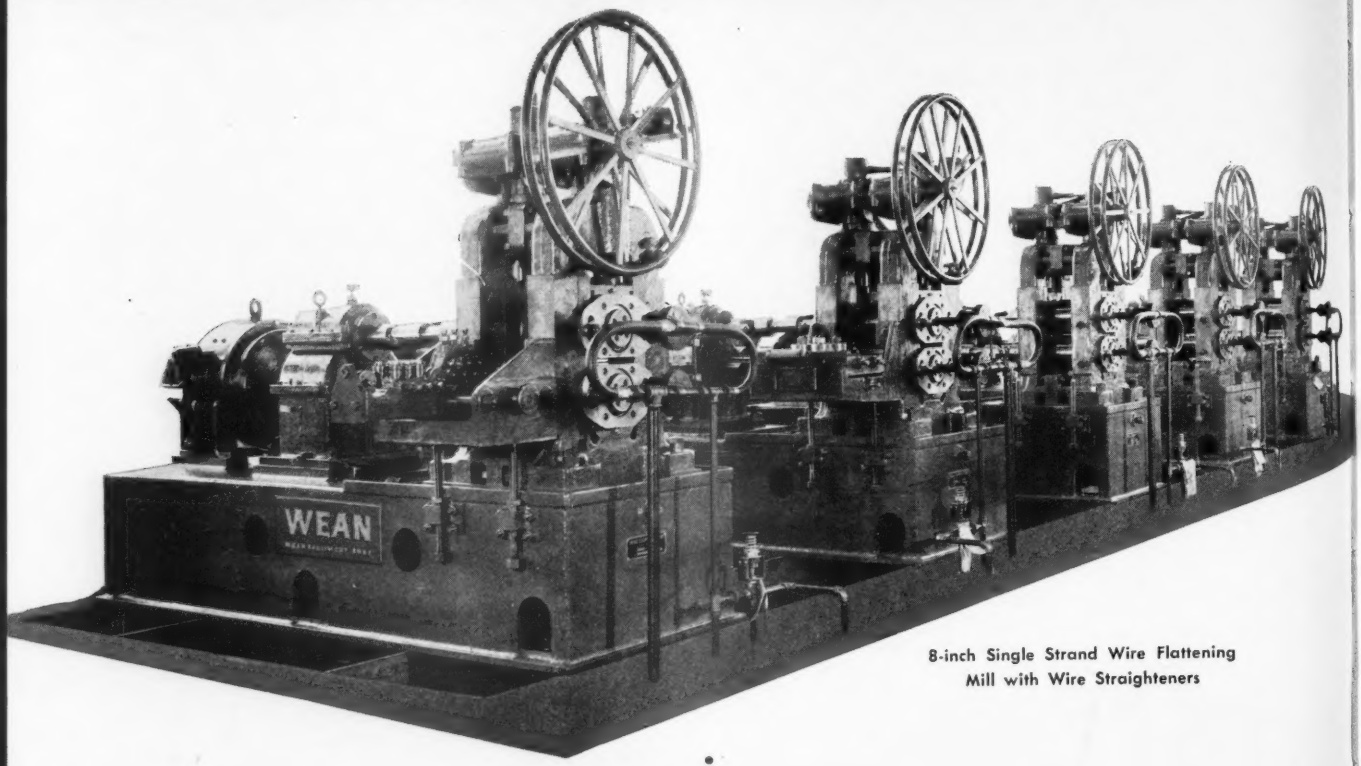

8-inch Single Strand Wire Flattening Mill with Wire Straighteners

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Complete Installations for Electro Galvanizing, Hot Dip Galvanizing, Patenting, Tinning, Wire Flattening, Nail Galvanizing and Blueing.

Complete Equipment for the Manufacture of Hexagon Netting, Hinge Joint Fence and Barbed Wire.

CHECK WEAN FIRST FOR WIRE MILL EQUIPMENT

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WEAN EQUIPMENT CORPORATION

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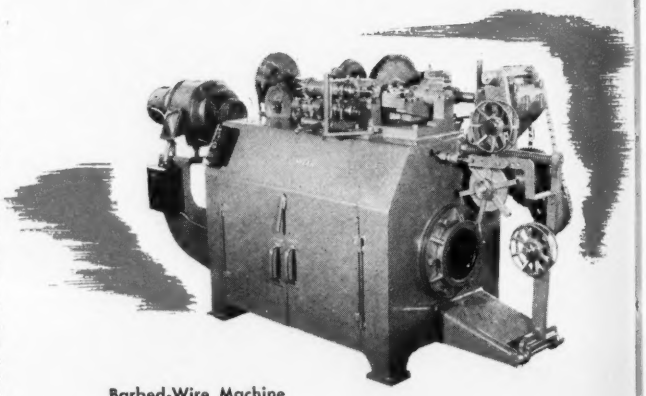
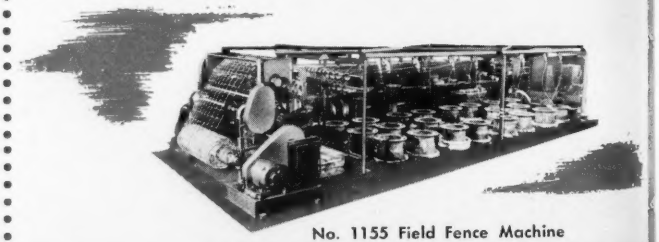


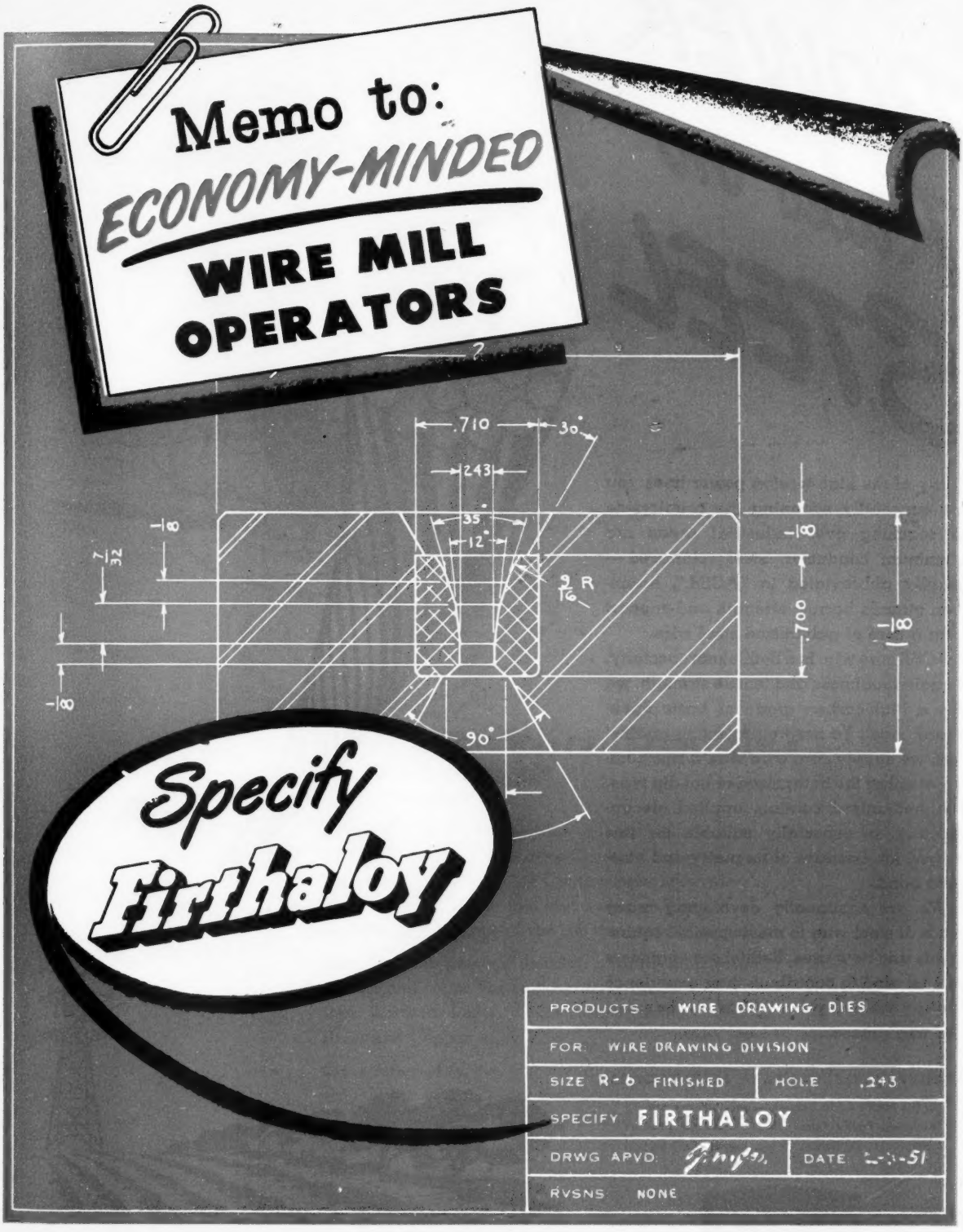
Barbed-Wire Machine



No. 1155 Field Fence Machine

Wean Equipment Corporation

CLEVELAND, OHIO



R-225

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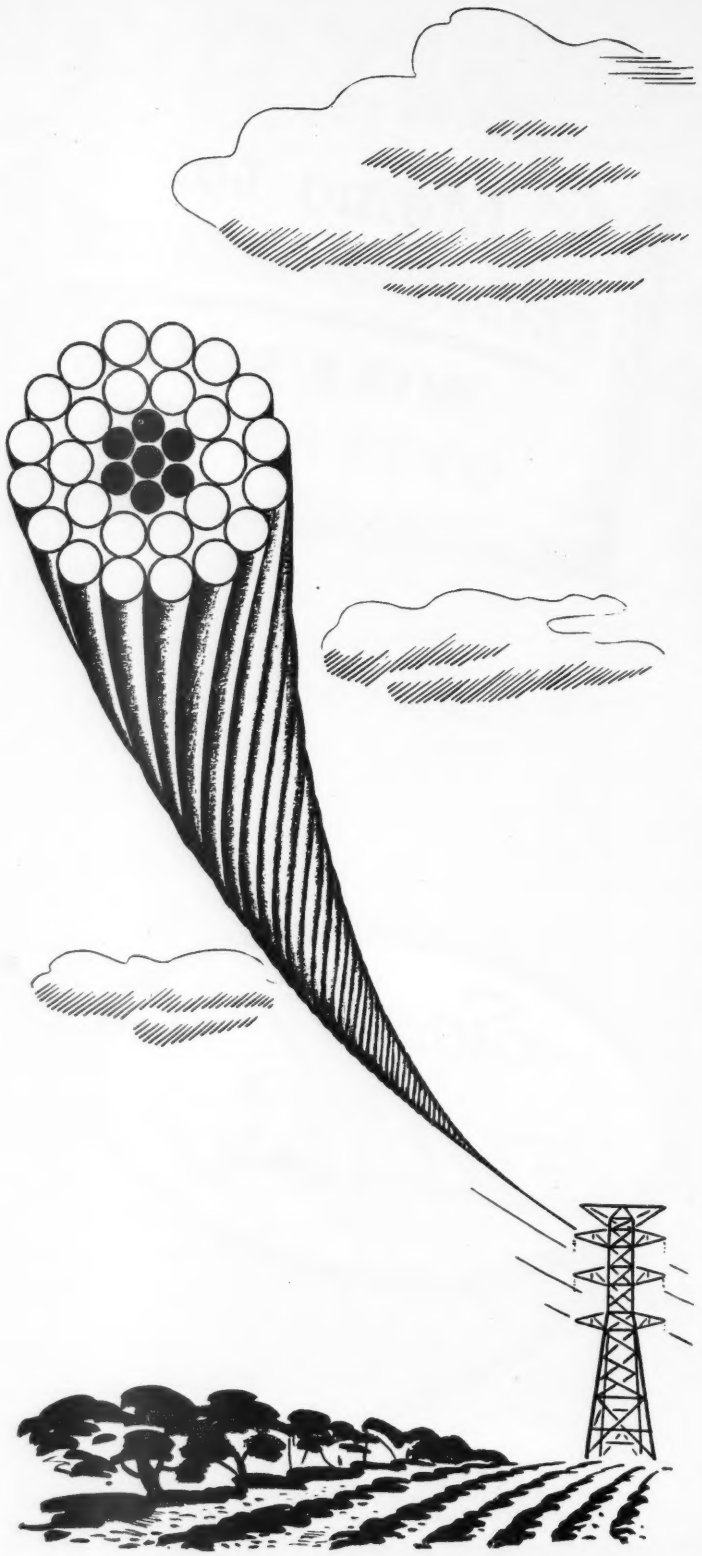

Many of the high-tension power lines you see gracefully spanning the countryside or reaching over industrial areas are aluminum conductor, steel reinforced—usually abbreviated to "ACSR." Aluminum strands borrow strength and support from a core of galvanized steel wire.

ACSR core wire is a Bethlehem specialty. To gain toughness and tensile strength, we use a high-carbon grade of basic open-hearth steel. To assure protection against rust, we supply core wire with a zinc coating of either the bethanized or hot-dip type. The bethanized coating, applied electrolytically, is especially suitable for this rugged job because of its purity and vise-tight bond.

We are continually developing many kinds of steel wire to meet special requirements and new uses. Bethlehem engineers will be glad to contribute their experience to any problems you may have in the selection and processing of steel wire.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

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★ BETHLEHEM STEEL ★ **BETHLEHEM WIRE**

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When wire twists and tangles as it uncoils, you lose production time. That's why Chase mills pay so much attention to the "cast" of Chase copper alloy wire. Uniformity of temper and stress makes Chase wire conform to the shape of the coil and unwind smoothly.

It is free from physical defects . . . uniform in gauge, texture and color. For cold-heading, Chase wire is tops. Write for folder "Chase Cold-Heading Extruded Brass and Copper Alloy Wire."

Chase Technical Service. Our metallurgical engineers are familiar with military specifications for brass and copper for ordnance components, and will be glad to consult with you on the selection of these metals for defense orders.

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let us show what you may
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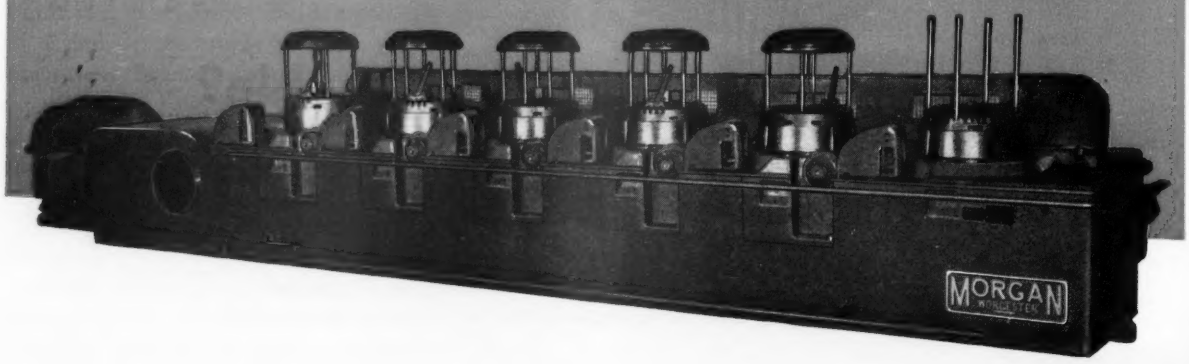
. . . on **your** work



ROLLING MILLS
MORGOIL BEARINGS
REGENERATIVE FURNACE CONTROLS
AIR EJECTORS
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WIRE MACHINES

WM60

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WIRE AND WIRE PRODUCTS*

Reg. U. S. Pat. Off.

A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable.

DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 27 MARCH, 1952 No. 3

Designated as Official Publication By The Wire Association

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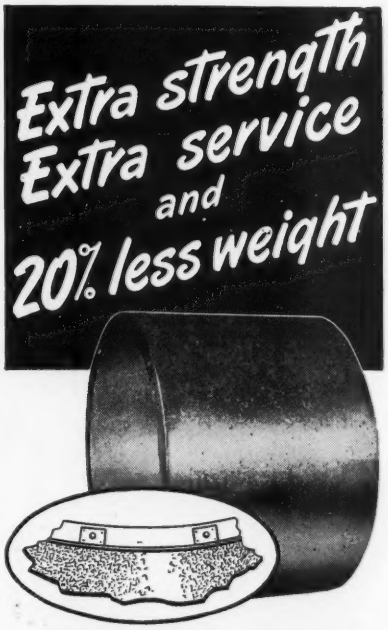

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FLANGED STEEL TRAVERSES

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. . . have extra strength where it is needed most—at bolt holes and base of the flange. This reinforcing makes possible the use of lighter gauge steel, saving up to 20% in weight while increasing overall strength.

Niles Flanged Steel Traverses have given as much as sixteen years' service without refinishing or major maintenance, according to actual experience records. In many cases their use has doubled the number of trips per reel before cut downs or scrapping of wooden heads.

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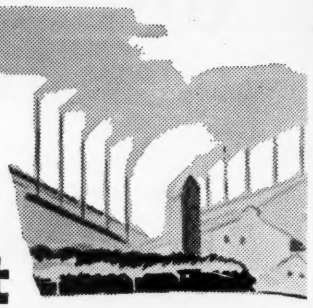
...and obsolete equipment



ARE "HOLDING UP" STEEL YOU NEED
—Help Fill These Empty Cars

Scrap is valuable! Scrap is precious! It's needed badly to maintain vital steel production. Whatever your business, you undoubtedly have some scrap. Check your plant today. Look specifically for obsolete machinery and equipment . . . jigs and fixtures no longer needed . . . worn-out or broken chain, wheels, pulleys, gears, pipe, etc. . . . abandoned metal structures. Help lick this critical scrap shortage by disposing of every pound of dormant scrap on your place. Call your local scrap dealer at once. Then you'll start getting the steel you are waiting for.

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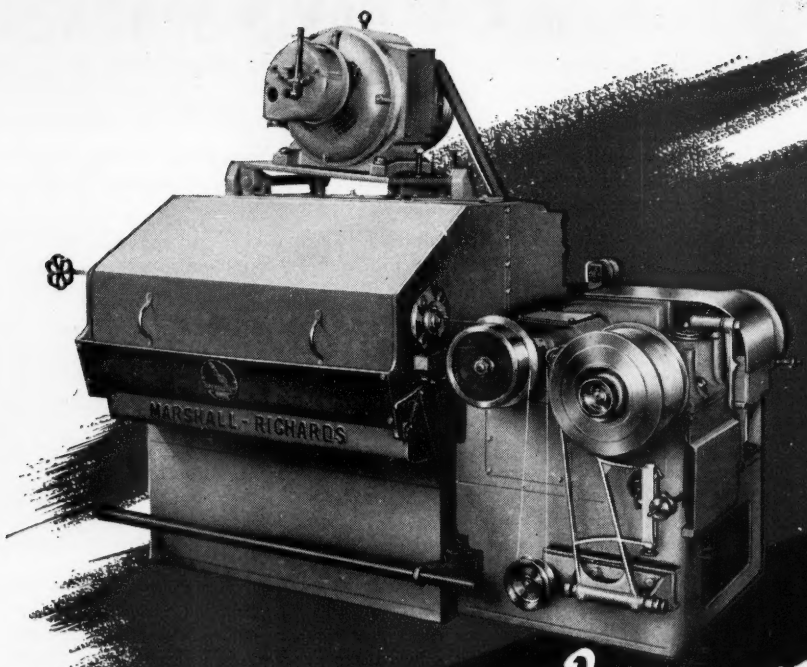

RAISE YOUR CORED SOLDER WIRE PRODUCTION

The technique of drawing modern flux-cored solderwires depends on careful preparation of the dies and on using them in machines SPECIALLY DESIGNED FOR THE JOB.*

We make a number of machines to cover the whole drawing process, starting with the extruded stock.

All this has been PROVED IN PRODUCTION and include those features which our long experience of the special requirements has given to us.

The machine illustrated draws from $\frac{1}{4}$" through 21 dies, finishing from ·128" at 1250 feet per minute.

* Solid solder, lead and zinc wires also require specially designed machines.

MARSHALL RICHARDS MACHINE CO. INC.

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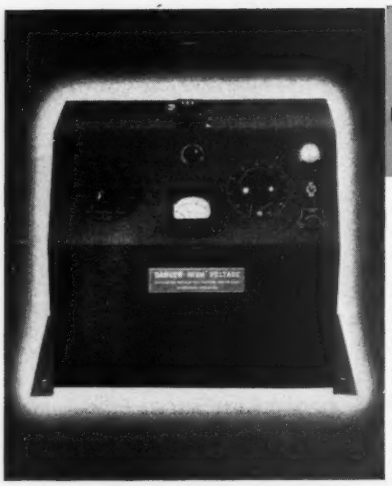


THE HIGHLY SENSITIVE C V DAVIS SPARKER

USED FOR TESTING INSULATION ON CONTINUOUS VULCANIZING OR PLASTIC EXTRUDING MACHINES

It is not enough that a sparker respond to imperfections in the coating material at low speeds. The factor of prime importance is the speed of reponse *at any speed* of the wire passing through the sparker.

Electric wire and cable run through a **DAVIS SPARKER**, at speeds of 50 to 2000 F.P.M., will have 99% of its dielectric faults, if any, indicated accurately and positively.

The **DAVIS SPARKER** has shown a remarkable degree of efficiency. Will respond in 1/180th of a second to any dielectric fault. This fast and accurate response has made the **DAVIS SPARKER** notable throughout the electric wire and cable industry for its dependability and accuracy. The **DAVIS SPARKER** performs its function with outstanding efficiency.

The CV Spark Tester machine is used on extruders and twinners to detect and count faults in any insulated wire or twisted pairs automatically, while the wire is being insulated with nylon, plastic, rubber, asbestos, tuflon, thermoplastic, or any other insulating materials. Then it is necessary only to retest the wire that is shown defective.

Our machine is equipped with a horn which sounds momentarily when there is a fault in the electrode, thus immediately notifying the operator when there is trouble with the insulation, so that the trouble can be rectified before making any quantity of defective wire. A reset magnetic counter simultaneously counts every fault.

To properly test the insulation with this type of machine, it is necessary to have a transformer that has sufficient current carrying capacity to hold up the voltage at all times. By special current limitation in the transformer, injury to the operator is prevented.

The standard voltage is 110. On requirement, special voltage can be supplied. By means of a powerstat and tap switch, you can secure a stepless range of voltage from 1,000 to 15,000 volts. This unit can also be obtained in voltage up to 30,000.

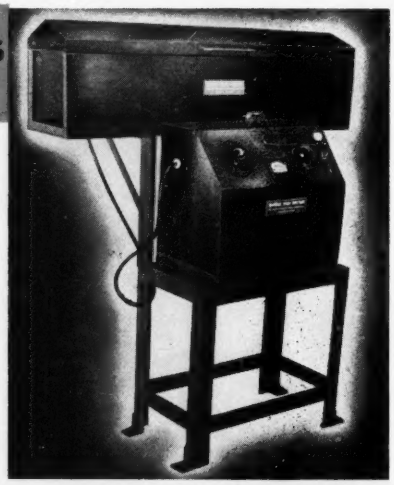
Use of this machine will not interfere in case you wish to extrude without testing.

This unit is obtainable with adjustable stand for wire line 35" to 42" (also without stand).

LISTED BELOW ARE THE STANDARD BEAD CHAIN TYPE ELECTRODES AND THEIR CAPACITY:

18" — 500 feet per minute — up to 1" wire size
24" — 800 feet per minute — up to 1" wire size
36" — 1200 feet per minute — up to 1" wire size
Footage can be increased by lengthening the electrode. Special type electrodes can be obtained for cable size up to 2".

TEST YOUR INSULATED WIRE FOR DIELECTRIC FAULTS WITH THE NO. 4 DAVIS SPARK TESTER



The purpose of the No. 4 Spark Tester unit is for respooling and resparking. This machine will automatically stop at, and locate any electrical defects in the insulated wire.

Standard supply voltage is 110. On requirement, special voltage can be supplied. By means of a powerstat and tap switch, you can secure a stepless range of voltage from 1,000 to 15,000 volts. This unit can also be obtained in voltage up to 30,000 volts.

The bead chain type electrode complete is mounted on top of the No. 4 Spark tester cabinet, with a 35½" wire line. A safety switch mounted in the door automatically shuts off the current from the spark tester, thus preventing injury to the operator.

LISTED BELOW ARE THE STANDARD BEAD CHAIN TYPE ELECTRODES AND THEIR CAPACITY:

18" — 500 feet per minute — up to 1" wire size
24" — 800 feet per minute — up to 1" wire size
36" — 1200 feet per minute — up to 1" wire size

Special type electrodes can be obtained for cable size up to 2". Footage can be increased by lengthening the electrode.

This DAVIS SPARK TESTER is so thoroughly engineered, it will, if instructions are followed, detect 99% of all faults in the insulation.

DAVIS EQUIPMENT

DAVIS ELECTRIC CO. WALLINGFORD, CONN., U.S.A.

HARNESS TESTERS • PAY-OFFS • TRAVERSES

SPARK TESTERS • SPOOLERS • TAKE-UPS

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You can substitute this coating for liquor finish where copper or liquor finish color are not required. STANCOAT No. 100 compound is suitable for:

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This is an acid coating. It makes a chemical, metallic bond, plus a physical bond to act as a carrier. It is easy to control. Cost of coating considerably less than liquor finish.

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STANDARD INDUSTRIAL COMPOUNDS COMPANY has pioneered most of the outstanding contributions to better wire drawing through better lubricants. Consult with STANDARD for the solution of your difficult problems. We welcome your inquiries.

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Scratchboard Drawing for Pittsburgh Steel Company by T. W. Hunter

Progress in Steel

New Blooming Mill Now Operating

More steel for defense—more steel for vital civilian needs is now being produced at Pittsburgh Steel Company as a part of its Program of Progress. With the completion of the giant new high-lift blooming-slabbing mill, shown above in operation, another important phase in this extensive plan has become a reality.

The new mill is rolling heavier ingots and rolling them faster than the old equipment to supply more high-quality steel to the Pittsburgh seamless tube mills, the rod and wire mills. Later, slabs for the new 66-inch hot strip-sheet mill, now under construction, will also be rolled on this multi-million dollar mill.

Despite its impressive size and importance, the new blooming mill is but one part of Pittsburgh Steel's Program of Progress. Other steps, such as the acquisition of the Thomas Strip Division at Warren, Ohio, have also been completed. In the steel works, more raw material is being provided—blast furnace capacity increased—open hearth furnaces enlarged—all designed to increase total ingot production by fifty percent.

The need for more steel grows daily as defense production is increased. The steel industry has accepted the responsibility of supplying greater quantities of this critical material and is expanding its capacity by millions of tons. The Program of Progress at Pittsburgh Steel is an important part of this unified effort which is designed to protect us from aggression and still adequately serve our daily needs.

Pittsburgh Steel Company

Pittsburgh, Pennsylvania

ANOTHER IMPORTANT MEMBER OF WATERBURY-FARREL'S LINE OF WIRE-WORKING MACHINERY

HOW THIS WATERBURY-FARREL WINDER puts trolley wire in its place

This new Waterbury-Farrel Trolley Wire Winder has an automatic, hydraulic, spool-traversing feature that assures a very accurate lay of wire.

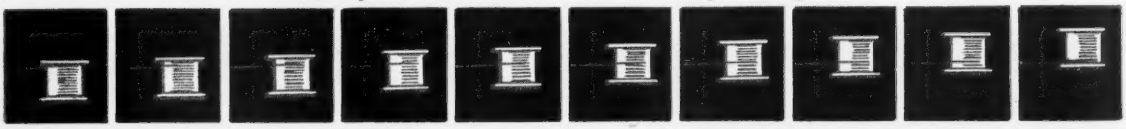
The wire moves straight ahead while the spool itself traverses. It moves across the path of the wire at exactly the right pace to put the wire precisely where it belongs on the spool. A special slip friction device compensates for the build-up of the spool.

This machine can be furnished to take spools up to 56" O.D., 31" barrel with a 26" traverse. It has a maximum capacity of 7,500 lbs. of wire plus approximately 1,800 lbs. for the spool . . . a total load of 9,300 lbs.

Further information on this machine or on any of the equipment indicated below is available on request.

WATERBURY FARREL FOUNDRY & MACHINE COMPANY
WATERBURY, CONNECTICUT, U. S. A.
Sales Offices: Chicago, Cleveland and Millburn, N. J.

The spool traverses . . . the wire stays straight



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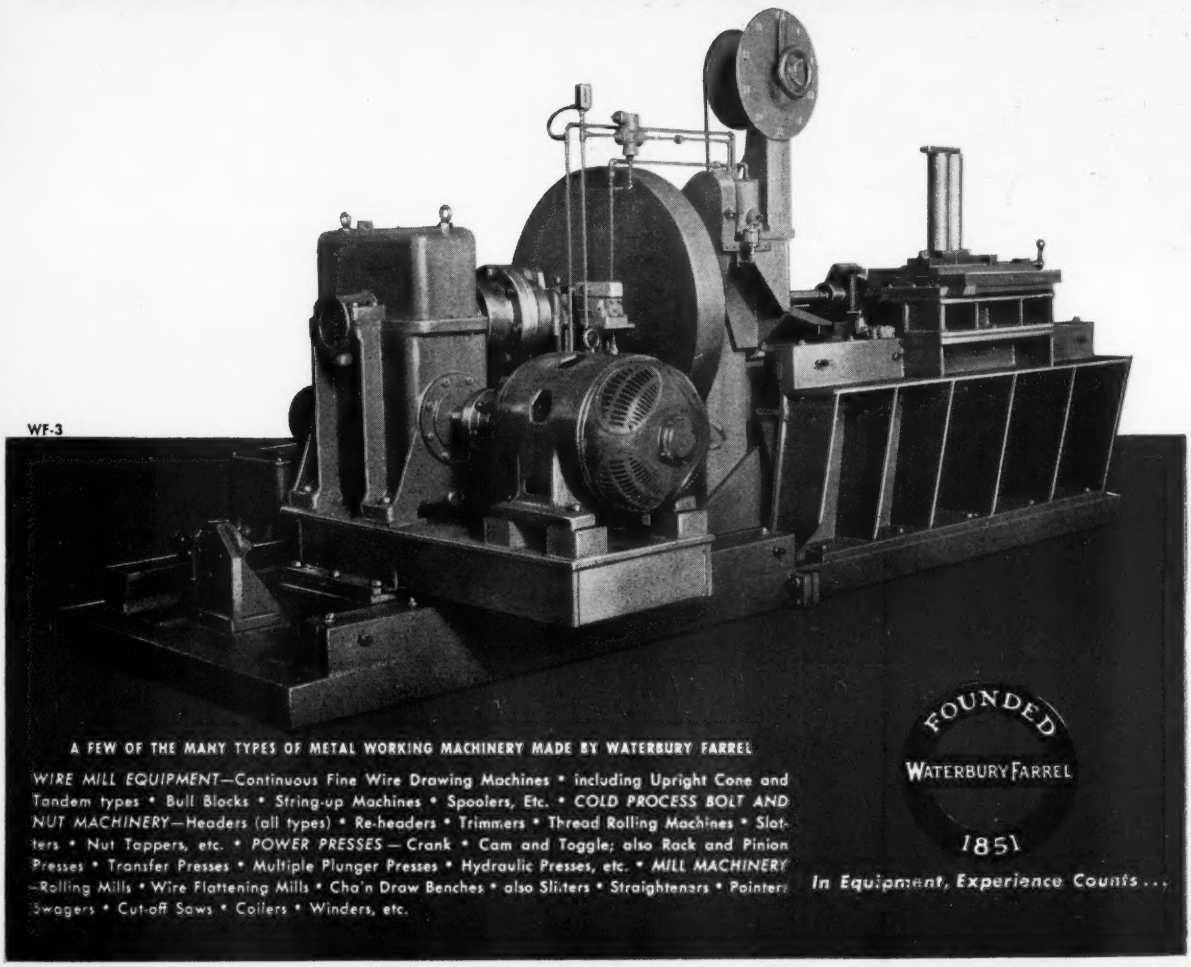

A FEW OF THE MANY TYPES OF METAL WORKING MACHINERY MADE BY WATERBURY FARREL

WIRE MILL EQUIPMENT—Continuous Fine Wire Drawing Machines • including Upright Cone and Tandem types • Bull Blocks • String-up Machines • Spoolers, Etc. • *COLD PROCESS BOLT AND NUT MACHINERY*—Headers (all types) • Re-headers • Trimmers • Thread Rolling Machines • Slotters • Nut Tappers, etc. • *POWER PRESSES*—Crank • Cam and Toggle; also Rack and Pinion Presses • Transfer Presses • Multiple Plunger Presses • Hydraulic Presses, etc. • *MILL MACHINERY*—Rolling Mills • Wire Flattening Mills • Cha'n Draw Benches • also Sliters • Straighteners • Pointers Swagers • Cut-off Saws • Coilers • Winders, etc.

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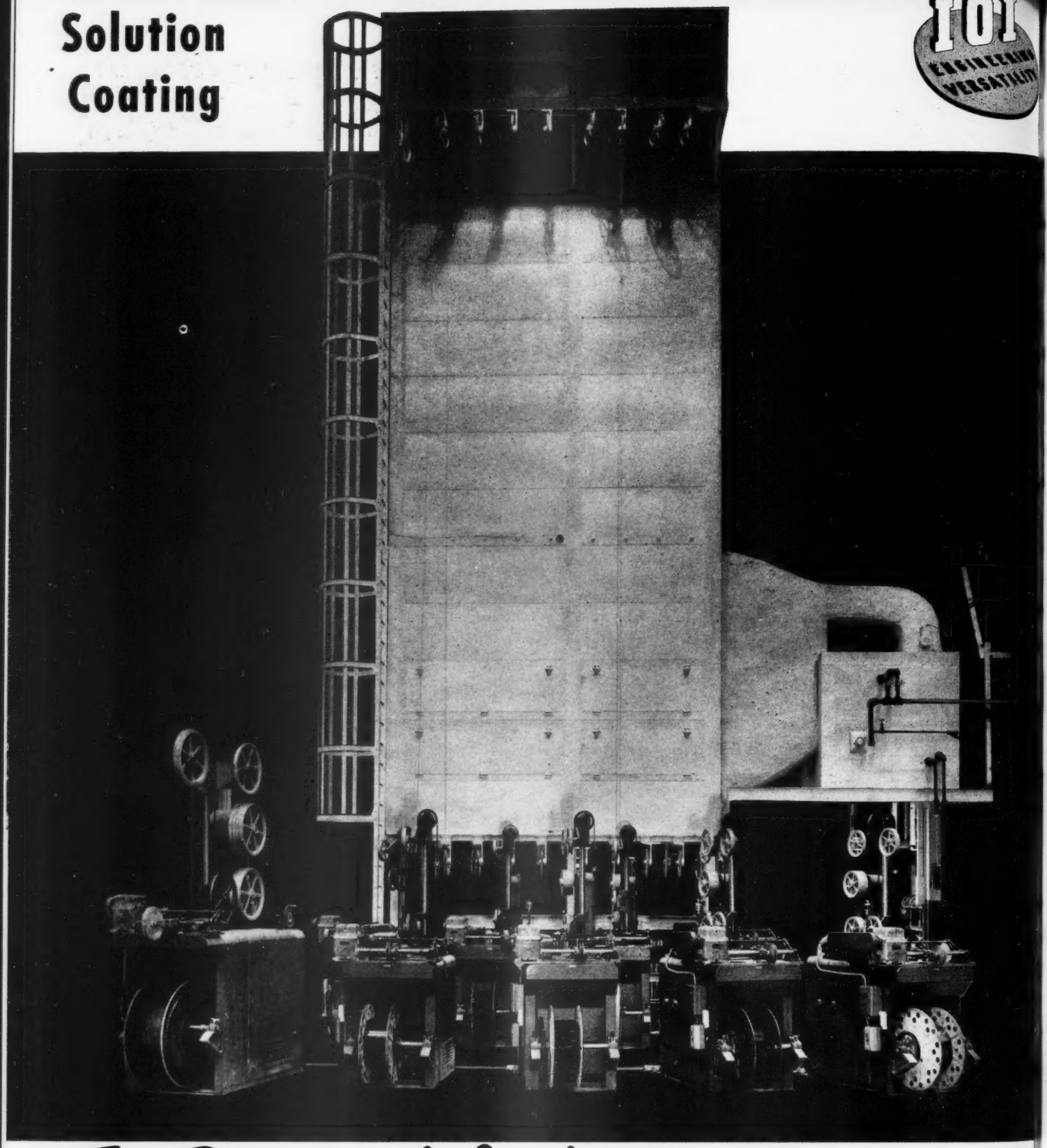

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LACQUERING MACHINERY AND EQUIPMENT

For Solution Coating with Lacquer, Enamel, Polyvinyl, Teflon and Nylon

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. . . At last a diamond compound that really works on carbide dies

CUTS CARBIDE FINISHING TIME UP TO 20%!

•

FIELD TESTED AND PROVED ECONOMICAL!

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READY TO USE—NO MIXING!

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ALL ELGIN DIAMOND COMPOUNDS ARE COMPLETELY PRODUCED BY ELGIN, AND CERTIFIED TO CONFORM TO U.S. BUREAU OF STANDARDS SPECIFICATIONS

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ELGIN NATIONAL WATCH COMPANY

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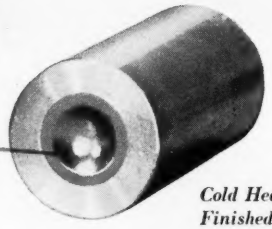
Tungsten-Carbide Punch, Hyprez Finished

Hyprez Saves Time on Difficult Drawing Dies



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SAVE MAN HOURS DIAMONDS TUNGSTEN-CARBIDE

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The scientifically balanced "OS" compound is formulated to match your finishing skill. It will not fly off tool or die; it is stable and uniform at all normal temperatures.

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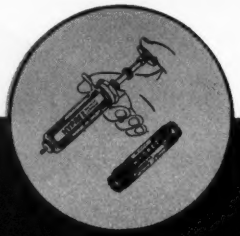
Hyprez Diamond Compounds produce a perfect polish on tungsten-carbide dies, tools and wear parts—quickly, economically. Hyprez engineered grades are available in color-identified 18 and 5 gram cartridges for use with the waste-preventing Hyprez Applicator Gun.

Write for complete information or free demonstration to Dept. W-352



HYPREZ DIVISION
ENGIS EQUIPMENT CO.
431 SOUTH DEARBORN STREET • CHICAGO 5, ILL.

Worried about the Wire situation?

● Each day, the mobilization program brings new and tougher problems for users of wire.

So *our* biggest job now, as we see it, is to help you solve these problems. And as the world's largest manufacturer of steel wire, we believe we can do it.

On our staff, we've got some of the best metallurgists in the world. They've worked on thousands of wire application problems. And—here's the best part—a problem that is new to you may be old stuff to our engineers. Maybe you're using a wire that's unsuitable for the job it has to do. No matter what your problem, our metallurgists are qualified to recommend the best type of wire for the application, and they are always ready to cooperate with you.

Anyway, if you're having trouble, it doesn't hurt to find out if we can help you.

This offer of free advice and help is nothing new. But we think you'll agree that this is a good time to repeat the offer.

UNITED STATES STEEL COMPANY
AMERICAN STEEL & WIRE DIVISION, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

AMERICAN MANUFACTURERS WIRE

AMERFINE—*High-quality fine wire.*

AMERSPRING—*music steel spring wire.*

AMERLOY—*alloy heading wire.*

AMERTEMP—*heavy-duty oil-tempered wire.*

AMERHEAD—*uniform heading wire.*

AMERSTITCH—*extra-tough metal stitching wire.*

U·S·S AMERICAN
MANUFACTURERS WIRE

USS TRADE MARK

UNITED STATES STEEL

NO SCRAP... NO STEEL!

QUALITY
YOUNGSTOWN
SERVICE

SCRAPPY SAYS:

AID DEFENSE

MORE SCRAP
TODAY...
MORE STEEL
TOMORROW

THE iron and steel industry faces a serious scrap shortage, growing more critical every day. . . . It will be impossible for producers to make the steel tonnages demanded for rearmament and essential civilian needs, unless consumers cooperate by furnishing *more scrap*. . . Most desperately needed now is heavy industrial iron and steel scrap. . . . Keep the cobwebs from gathering at your own plant by turning in more of your own scrap today.

The Youngstown Sheet and Tube Company

General Offices--Youngstown 1, Ohio
Export Offices--500 Fifth Avenue, New York
MANUFACTURERS OF CARBON ALLOY AND YOLOY STEELS

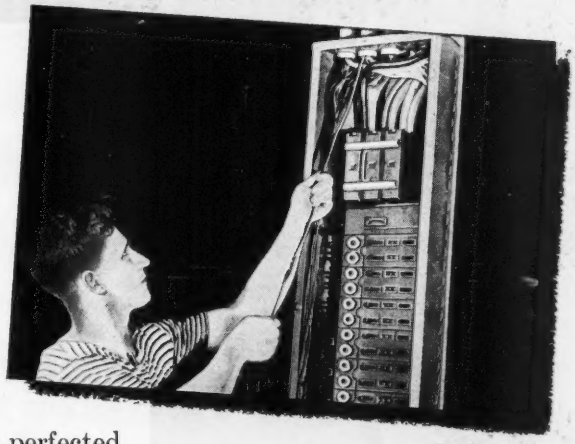
The steel industry is using all its resources to produce more steel, but it needs your help and needs it now. Turn in your scrap, through your regular sources, at the earliest possible moment.

New Building Wire with Glass Braid

SMALL IN DIAMETER . . . MAXIMUM FISHABILITY

SATURATED AND FINISHED with NEWLY DEVELOPED *Solar* COMPOUNDS

Wire manufactured by Triangle Conduit & Cable Co., Inc., New Brunswick, New Jersey.*



This new building wire with its recently perfected covering provides superior protection and maximum flexibility. It's small in diameter, light-weight . . . easy to carry and store. The wire is tough enough to withstand tight coiling without chipping, flaking or peeling off. And it's extra smooth—neither sticky nor gritty—for maximum fishability.

The newly developed Solar compounds with which the wire is saturated and finished contribute significantly toward its versatile characteristics. The saturant and finisher, specially compounded for use over glass braid, permanently bond the individual fibers and set new standards for resistance to heat, fire, rot and moisture. In addition, the wire is painted with a Solar Soldura color solution for polarity identification and as an antistick.

Perhaps this saturant and finisher, or another of the Solar compounds or Soldura color solutions, can help you make a better product. Our laboratory facilities and technical staff are available to you without obligation. Write Solar Compound Corporation for further information.

*Trademark, "Glazon"

TECHNICAL INFORMATION

SOLARITE KS-566 SATURATING COMPOUND

Composition: Composed of processed asphalts combined with other ingredients particularly chosen for their low susceptibility to temperature changes.

Specifications:

Softening Point—ASTM D-36-26. 140° F. Minimum
Penetration @ 77° F., 100 grams, 5 seconds—ASTM D-5-49.....60-75
Stormer Viscosity @ 300° F., 100 Revolutions.....85-110 Seconds
Specific Gravity @ 25° C.—ASTM D-71-27.....1.00-1.04
Flash Point—ASTM D-92.....500° F. Minimum
Fire Point—ASTM D-92.....600° F. Minimum

CHARACTERISTICS AFTER APPLICATION:

Aging Characteristics: Will remain flexible indefinitely when applied under recommended, controlled conditions.

Flame Resistance: Has some flame resistance, but must be used with a flame-retardant finisher to meet Underwriters' Laboratories Standards.

Moisture Resistance: Excellent.

Low Temperature Resistance: Retains flexibility at temperatures as low as 0°F.

High Temperature Resistance: Will not cause sticking in coils up to 140° F. when used with recommended finishing compounds and anti-stick coatings.

Coverage: Estimated coverage 50% of the weight of the glass.

SOLARITE KF-561 FINISHING COMPOUND

Composition: Composed of a blend of oxidized petroleum asphalts particularly chosen for their low susceptibility. Efficient flame retarding ingredients are chemically combined.

Specifications:

Softening Point—ASTM D-36-26. 220° F. Minimum
Penetration @ 77° F., 100 grams, 5 seconds—ASTM D-5-25.....14-16
Viscosity, Stormer—360° F.....3-10 RPM
Specific Gravity @ 77/77° F.—ASTM D-71-27.....1.02-1.06
Flash Point—ASTM D-92.....Over 500° F.

CHARACTERISTICS AFTER APPLICATION:

Aging Characteristics: Flexibility will be retained when applied as recommended.

Flame Resistance: Designed to meet Underwriters' Laboratories Standards.

Moisture Resistance: Meets Underwriters' requirements when applied over saturated braids.

Low Temperature Resistance: When used with saturants recommended specifically for cold bend resistance, the finished wire may be bent around the same sized mandrels used in the moisture tests without flaking at 0° C. Solarite KS-566 is a recommended saturant. Other saturants may be employed depending upon the conditions to be met.

High Temperature Resistance: Mica or paint to be used as an antistick.

General Characteristics: Will not discolor properly formulated color solutions.

THE NEW SOLAR CATALOG CONTAINS:

Pictorial presentation of complete laboratory and plant facilities
Detailed description of all major testing methods
Product end uses, description and composition
Methods of application
Characteristics after application
And other valuable technical information

Catalog available to executives and technical men. Please send request for your free copy on company letterhead.

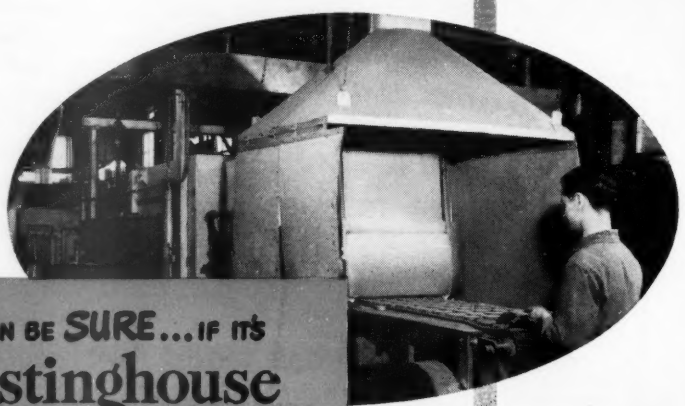
Solar Compounds Corporation
Solar Varnish Corporation
1213 WEST BLANCKE STREET • LINDEN, N. J.

"Performance and Service sold us" ...Says Presmet Corp.

"Quality component parts for nearly every conceivable field are successfully sintered in our Westinghouse continuous belt conveyor furnace," reports Presmet Corporation. The furnace is used for sintering copper, brass, bronze, iron and steel, and also for copper and brass impregnation of iron and steel parts.

This is the second Westinghouse heat-treating furnace now employed by Presmet Corporation. Decision to add another Westinghouse unit was based on their record of furnace performance and the high degree of Westinghouse service.

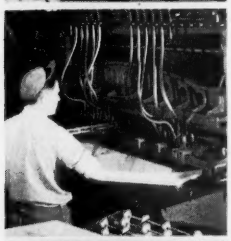
Gas-fired or electric, there's a Westinghouse furnace to meet every heat-treating need. For toolroom application or continuous-line high production, it's your assurance of an unbiased answer to your all-important problem. Get the facts from your Westinghouse representative. Write today for new 40-page book B-5459, "Harnessing Heat". Westinghouse Electric Corporation, Industrial Heating Department, Meadville, Pennsylvania. J-10374

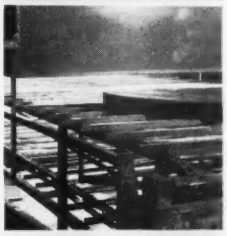


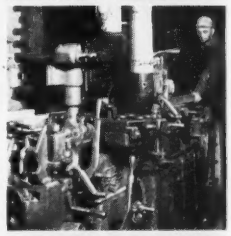
IF YOUR PRODUCT CALLS FOR HEAT-TREATING . . . IT CALLS FOR A WESTINGHOUSE FURNACE . . . GAS OR ELECTRIC

YOU CAN BE SURE...IF IT'S Westinghouse

HEAT-TREATING FURNACES







ARE YOUR REELS PRODUCED ON A FAST-MOVING PRODUCTION LINE ?

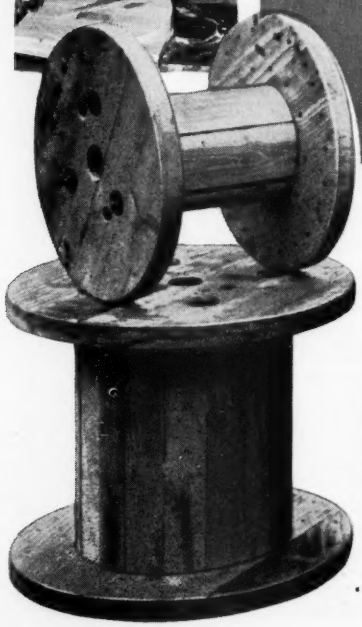
The Bridge plant for manufacturing wood reels for ROPE, CABLE and WIRE is the last word in streamlined production. All work flows in one continuous line through modern, precision equipment, to make the finest, precision-made reels that can be produced at the lowest possible cost.

The operations depicted here are

Sawing	**Painting**
Nailing	**Assembling**
Boring	**Shipping**
Grooving	**Trucking**

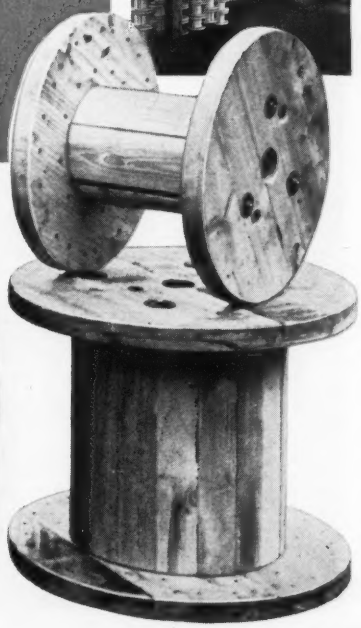
Bridge reels are made to your specification by straight line production methods. Rapid tooling set-up makes it possible to produce your order efficiently. We make nothing but reels and can do that job to your complete satisfaction.

The Bridge distribution service is unequalled. Deliveries to points like St. Louis in 4 or 5 days. Truck deliveries to your door to points 200 miles from Hazardville. Overnight, if urgent.

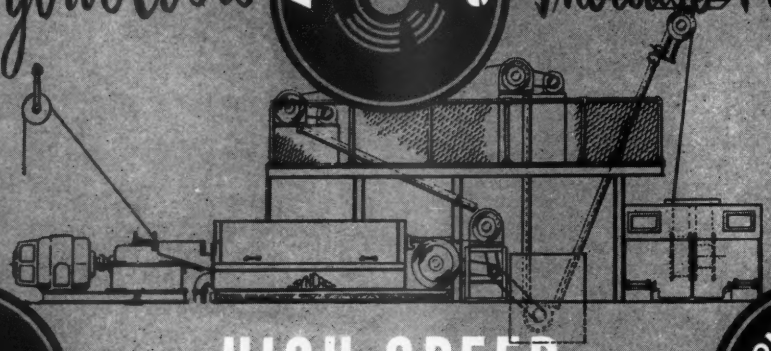


BRIDGE
MANUFACTURING CO.
HAZARDVILLE, CONN.

Phone Thompsonville, 3375



Reduce your Costs ANNEALING Increase Production



DRAWING

CONTINUMATIC SPOOLING

HIGH SPEED CONTINUOUS OPERATION

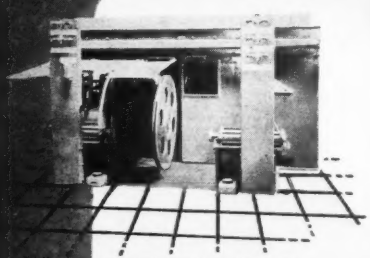
FOR

DRAWING AND RESISTANCE ANNEALING

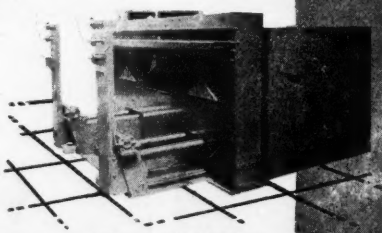
MADE POSSIBLE WITH

CONTINUMATIC SPOOLING

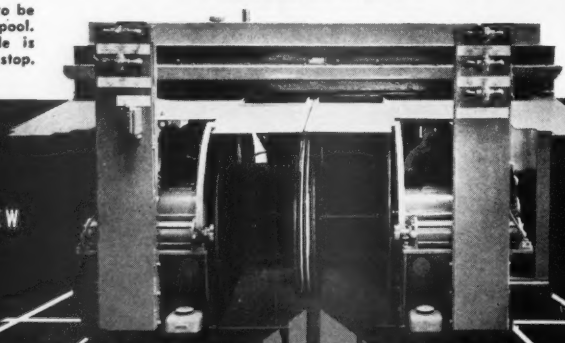
EXCLUSIVE SUPERIORITY BY PROVEN FIELD USE
NO SPOOL CHANGE-OVER SHUT DOWNS
SUCCESSIVE STARTING SHOCK LOADS ELIMINATED
PRE-DETERMINED PACKAGE WEIGHTS ASSURED
DESIRED ELONGATION WITH CONSISTENT QUALITY
MINIMUM OF CURRENT CONSUMPTION
HIGHER PERSONNEL SAFETY



Wound spool ready to be replaced with empty spool. Another spool inside is still spooling without stop.



Bottom center: view showing spool arrangement. Directly above: view shown during operation.



SOMETHING NEW

SOMETHING BETTER

ENGINEERS ALL OVER THE WORLD ACCLAIM
THIS EXCLUSIVE SCIENTIFIC ACHIEVEMENT OF

PERTH AMBOY **MACHINE COMPANY** NEW JERSEY • USA

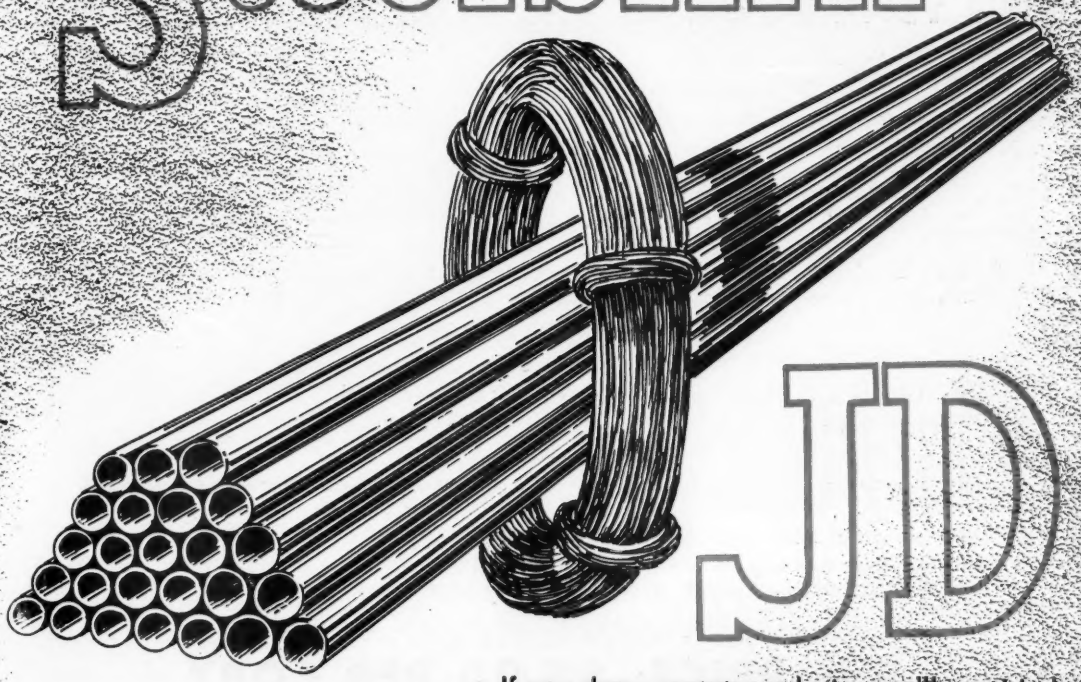
AFFILIATED COMPANY: WINGET-SYNCRO, ROCHESTER, KENT, ENGLAND

FURTHER DETAILS OF THIS ADVANCED IMPROVEMENT AVAILABLE ON REQUEST

NEW

For drawing COPPER and COPPER-COATED wire and tubing . . .

Steelskin JD



If you draw copper products, you'll want to know more about STEELSKIN J. D. Satisfied users of this new Steelskin Product include such companies as Chase Brass and Copper Co. and General Cable Company.

Write today for further information on Steelskin J. D.

Steelskin LUBRICANTS

R. H. MILLER

Company, Inc., Homer 1, N. Y.

Place Your Order Now

for Your Copy of the New 1952 Edition of the

WIRE AND WIRE PRODUCTS

BUYERS' GUIDE

AND YEAR BOOK OF THE WIRE ASSOCIATION

The BUYERS' GUIDE is an indispensable Reference Book for everyone in the Wire Industry. You need this new edition.

Revised and brought up-to-date. Over 30,000 listings under classified headings of manufacturers of wire, wire products, machinery, equipment and supplies used in the industry.

Helps you to locate quickly what you want when you want it. A useful book for buyers. Authoritative, carefully compiled and contains many changes in listings. Handy in size: 5" x 8".

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List of authors of articles published in 1951.
The Constitution and By-Laws of THE WIRE ASSOCIATION.
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You will want this 1952 BUYERS' GUIDE on your desk. Send orders to

WIRE AND WIRE PRODUCTS

STAMFORD 453 MAIN STREET CONNECTICUT

FLAT SPRING STEEL

You can get it now! . . . and we believe it's the best spring steel we've ever made

OUR NEW specialty spring steel plant is in full swing. Equipped with today's most modern, precision machines, we believe we're producing flat spring steel that gives more for your money than ever before.

This new spring steel is tops in uniformity. It saves you preparation time . . . cuts down machine stoppages . . . gives you the greatest number of perfect parts from every foot and pound of steel.

With our greatly increased capacity we can make prompt deliveries on flat spring steel. And if you need high carbon round or shaped wire, ask what we can do. John A. Roebling's Sons Company, Trenton 2, N. J.

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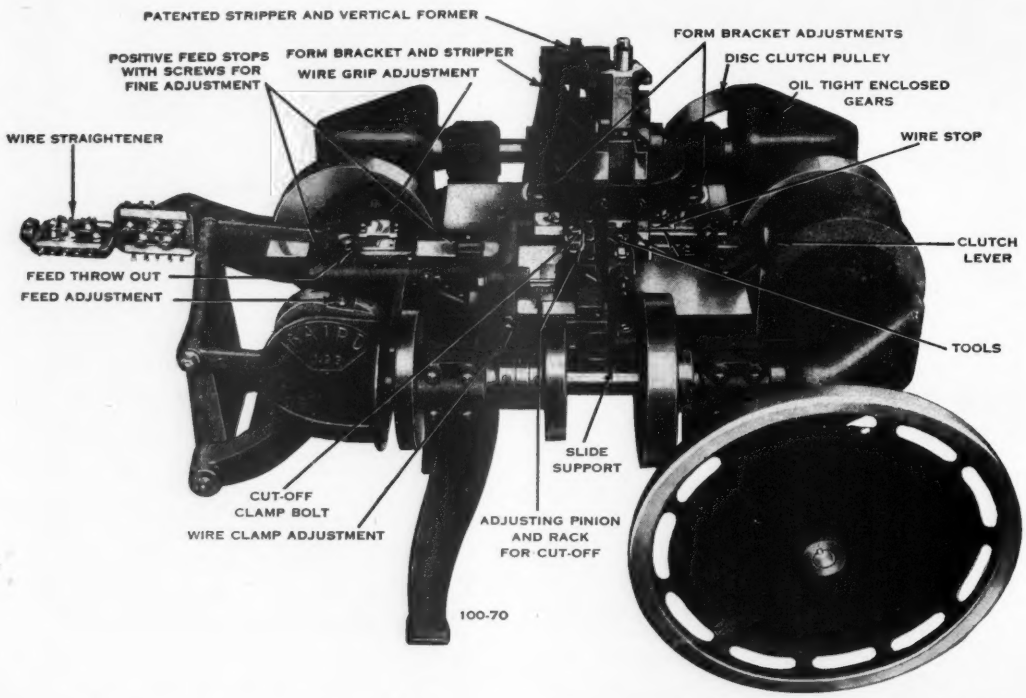
HIGH PRODUCTION TOOLING



WIRE FORMS and COILED STRIP WORK *"unlimited"* with BAIRD FOUR SLIDE Automatics

The FOUR SLIDE is actually a basic design of machine, not a jack-of-all-trades, but one which we stock and tool to your specific requirements for high speed repetitive production. There are 8 standard sizes that cover wire diameters from 1/32" to 1/2" and ribbon widths from 3/16" to 1-3/8" . . . larger capacities on special order.

Machines may be supplied with crowned pulley for V belt drive from countershaft, or with standard or variable speed motor drive mounted directly on the machine . . . V belt from motor sheave to machine pulley. Operation is smooth and quiet.

Tooling possibilities are extensive and can still be increased by the ingenuity of the toolmaker.

Standard attachments are Form Raising, Pin Pulling, Ring Setting and Horizontal Presses. Special attachments will be designed and built to suit specific jobs.

To discover how you can cut costs with this Four Slide machine . . . "ask Baird about it."

the BAIRD MACHINE COMPANY
STRATFORD • CONNECTICUT

AUTOMATIC MACHINE TOOLS • AUTOMATIC WIRE & RIBBON METAL FORMING MACHINES • AUTOMATIC PRESSES • TUMBLING BARRELS

5BA51

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The Sign of Good Drawing...

For more than 30 years the word "Magnus" applied to a wire drawing compound has been a guarantee of good drawing . . . and often uniquely good drawing. More often than not, Magnus pioneered the new compounds that are now in standard use . . . leading to faster draws, better finished wire, lower drawing costs and longer die life.

But while you can apply one or more items in the regular Magnus line to your volume production, there always are special problems in wire drawing that call for highly specialized and cooperative research. We'd like to work with you on any of these difficult drawing problems that are giving you trouble. Not only to help you solve your specific difficulties . . . but to see if, in solving particular drawing problems, we can develop improved compounds with broader fields of application. We know this is possible, because not a few of the Magnus materials which are speeding wire production today evolved from similar programs of tackling specific drawing problems.

Work now in progress in the Magnus research laboratory may very well fit into one or more of your drawing operations where difficulties remain to be overcome. May we hear from you?

MAGNUS CHEMICAL COMPANY, INC.
188 South Avenue, Garwood, N. J.

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CLEANERS • EQUIPMENT • METHODS

For the FINEST Dies...

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IN CANADA: (TOOLS) CARBIDE TOOL CO. W. Toronto 9, Ont. (DIES) VASCARB TOOL & DIE CO. Hamilton, Ont.

The Wire Outlook

Business activity is holding steady during the first quarter and is a little higher than last year.

The peak of the steel shortage is believed to have been passed. A partial de-control of steel distribution is being urged, and because with some tonnage products in better supply, there is a threat of surpluses unless controls are eased. Among the items suggested for de-control are merchant wire products (fencing, barbed wire, etc.), which are readily available now. Generally, there should be more materials for civilian goods in the second half, even if not an abundance of them. This does not mean that defense schedules are being cut back; actually they are building up gradually. An all-out war, of course, would change this outlook drastically.

The adjustment to a partial war economy has proceeded with remarkable smoothness, all things considered, although the relative few who are adversely affected might not agree with this statement. Many brass mills are operating 3 and 4 day work weeks. Some auto assembly plants, with not enough work to justify remaining open, have closed down. Nevertheless, in the midst of extensive changes, our production economy is showing up well as to the general level of production, trade and employment. This stability is an encouraging indication for the future.

Copper and aluminum are now foremost in the limelight as critically short metals. Copper deliveries declined in 1951 some 3700 tons under those of 1950, which is worse than it appears, considering the higher demand. About 15,000 tons of copper will be produced in 1952 over the 1,609,000 tons refined in 1951. More production is on the way, as the many expansion projects can be placed in production. Strikes here and in Chile last year cost us 50,000 tons of copper. The outlook is therefore for a bleak year, with supply improving toward the end of 1952. Prospects for better supplies of zinc, lead and tin are also good. Imports of these metals are increasing, whereas they had fallen sharply last year. Questions of the more efficient use of metal and substitutions are also being stressed to reduce the gap between what is available and what is to be made.

Some softening in the demand for wire products is attributed to the fact that defense buying is not as active as expected, especially for aircraft construction. High carbon rod supply has improved and there has been a corresponding upturn in the calls for high carbon wire. Precision spring demand is soft and valves and clock spring wire sales are off sharply, although the latter shows some signs of early improvement. Upholstery nails and tacks are plentiful. The demand for barbed wire, fencing and baling wire is strong, keeping jobbing inventories low. Cut-backs in civilian durables has eased the demand for fasteners, but defense orders are gradually taking up this slack.

One factor that will help to provide a good future outlet for all the expansion projects now on foot is our remarkable population growth. The former birth record occurred in 1947, when 3,800,000 future citizens came into being. In 1951 the baby "crop" was 3,925,000. Our population doubled in the last 50 years, and in the next 25 years there should be at least another 35 millions added to our present 155 millions. It will take a lot of new houses, household goods, automobiles and so forth to provide for this growing population—into which will go great quantities of wire.

The future of our country seems assured, provided the politicians can be stopped from squandering our birthrights and hopelessly mortgaging future generations.

—from the Editor's Desk

JLE HEAVY DUTY REEL TAKE-UP

AN IMPROVED, STANDARD TAKE UP FOR REELING EXTRA-HEAVY CABLE

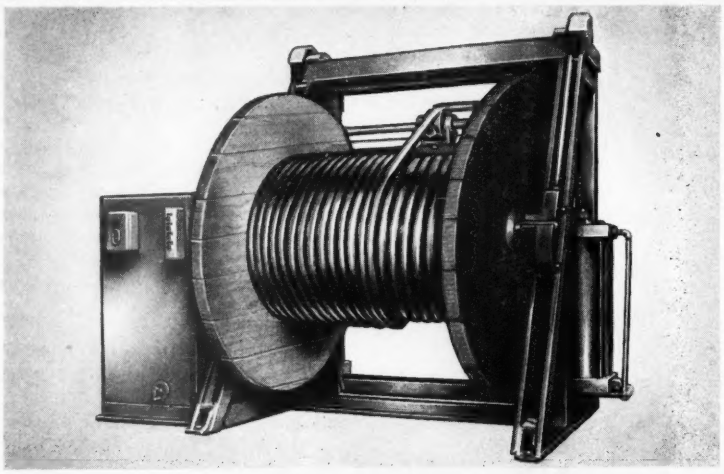
Following Drives are Available:

—— Motor-Drive-6 types ——

Constant - Reel - Shaft Speed, Fixed
Constant - Reel - Shaft Speed, Adjustable
Constant - Wire - Speed
Constant - Speed Drive, Slip - Clutch
Variable - Speed Drive, Slip - Clutch
Constant - Wire Tension, Slip - Clutch

—— External-Drive-3 types ——

Slip - Belt Drive
Constant - Speed Drive, Slip - Clutch
Constant - Wire - Tension, Slip - Clutch



The Machine Illustrated

Reel Capacity - 36" to 72" Reel Diameter
Reel Weight - 18,000# with 100 P.S.I. Line Pressure
- 11,000# with 60 P.S.I. Line Pressure
Drive - Motor Drive with - Variable-speed and slip clutch units.

OUTSTANDING FEATURES

1. Pneumatic reel lift with rugged JLE Cylinders.
2. 18" to 84" diameter reels. Available in 5 frame sizes.
3. Heavy - duty frame. Welded unit construction.
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THE MANUFACTURE AND USE OF FOURDRINIER WIRE CLOTH

by A. G. Hose and J. P. Johnson
The Lindsay Wire Weaving Company
Cleveland, Ohio

In this very thorough study of the manufacture and the uses of Fourdrinier wire, the authors have presented a picture of tolerances and standards that are far in excess of those required for most wires. However, there are valuable lessons to be learned from a description of the exacting requirements of this highly specialized type of wire and the product into which it is made.

In order to better appreciate the need for the accuracy and care that goes into the manufacture of Fourdrinier Wire Cloth, let us first visit a paper mill and see some of the demands that are made on the cloth in use.

The Fourdrinier Machine and Functions of the Wire

The Fourdrinier paper machine was invented and developed by Henry and Sealy Fourdrinier, assisted by Bryan Donkin, an engineer, early in the nineteenth century. The machine uses an endless belt of wire cloth as a support for paper sheet formation and for the removal of considerable water from the paper stock.

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Treatment of paper stock before it reaches the paper machine depends on the type of pulp (groundwood, sulphite, kraft, etc.), the kind of paper being made (tissue, book, news, etc.), and several other factors. Since we are primarily interested in the function of the Fourdrinier wire, these details of pulp manufacture will not be considered here. Following various stages of refining, the stock reaches the machine headbox where it is diluted to the consistency (water content) required for proper sheet formation on the Fourdrinier. Consistency will vary from 97.5 to 99.5% water, depending on the nature of the sheet desired. The headbox supplies stock to the slice under a constant head, or pressure; thereby ensuring a constant velocity of flow. The slice, or stock inlet, is adjustable to give a constant volume of flow across the machine. Sheet formation is assisted by a transverse shaking of the Fourdrinier table. This constant vibration aids in the spreading of the fibers evenly and helps form the sheet by criss-crossing, or inter-weaving the fibers to produce a mat.

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The wire cloth, or "wire", as it is called in the trade, is supported during this first part of its run by rolls, called table rolls. These rolls, in addition to furnishing support for the wire, aid in water removal, both by capillary action and by the suction created as the rolls rotate.

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Once the sheet is formed, it is desirable to remove water as rapidly as possible. This removal is accomplished with a series of suction boxes. Suction boxes are long, narrow boxes, the tops of which are slotted or drilled to allow the passage of water. Boxes are connected to vacuum pumps capable of maintaining a vacuum of from five to ten inches of mercury. The higher the vacuum, the more water is removed. High vacuum, however, increases the drag on the wire resulting in more wear on wire and box covers. An economic balance consistent with production demands dictates the vacuum to be carried. Fairly large volumes of water are removed from the paper in this way, which may amount to as much as 90% of the water originally in the stock. A series of presses, something like huge wringers, remove about half of the remaining water. Finally the sheet is carried over a series of large steam heated drums, called dryers, which reduce the moisture content to the 5 to 6% normally present in finished paper.

The Wire Must Be Able to "Take It"

Let us now consider some of the demands that this paper-making process makes on the Fourdrinier wire. These demands influence the

choice of raw materials and the amount of care and accuracy that must go into the various stages, from incoming metal to the finished wire cloth installed on the paper machine. We could not tolerate an inferior wire, nor would we want to raise the cost unnecessarily by performing operations that were not needed.

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It is obvious that the wire must stand considerable tension. It must be taut enough to afford a smooth flat surface for sheet formation. The wire is driven by the couch, the roll nearest the presses, but the wire drives all other rolls that it contacts besides overcoming the drag on the suction boxes. As the speeds of paper machines increase, these tensions mount. In the old days with speeds of 200 to 500 feet per minute, tensile strength wasn't quite so important. Now, in a good many instances, speeds are crowding 2000 feet per minute, especially on tissue, news, and kraft. In one or two cases the 2000 foot mark has been passed and the goal has become 3000 feet per minute. We may be approaching the point where the mechanical strength of the wire cloth will be a factor in limiting further speed increases.

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Tension is only one factor influencing the physical requirements of the wire. Friction and abrasion team up to demand a material that is very resistant to wear. The primary source of friction, of course, is at the suction boxes. Oftimes materials used in fillers or sizes will be more or less abrasive; or perhaps a little sand or silt gets into the mill's fresh water intake. Some of this material gets embedded in the suction box covers resulting in an abrasive medium as effective as the best emery paper.

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Another obvious consideration is fatigue. As the wire runs it is subjected to repeated reverse bending as it contacts the various rolls on the Fourdrinier. Good resistance to this fatigue is a must if we do not wish our wire to fail from fatigue cracking long before it is worn out.

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One other item, before we leave factors affecting properties of materials. That item is corrosion. In the early days it didn't seem to come up very often. There are still many paper mills where it isn't considered serious, at least as far as the Fourdrinier is concerned. However the problem of corrosion of Fourdrinier wires seems to be increasing in both extent and complexity.

Uniformity Essential

These material demands are not the only requirements for a satisfactory Fourdrinier wire. We mentioned that the primary functions of the wire are sheet formation and water removal. The two are interrelated. If water drains too fast, the sheet may not have time to form properly or too much stock may go through the wire resulting in poor formation and fiber waste. If drainage is too slow, the sheet may be too wet going into the presses and be crushed as water backs up at the press rolls. Drainage must be uniform, both across the wire and throughout its length, otherwise formation will not be uniform and the paper produced will not be satisfactory. Besides draining uniformly, the wire must have a smooth, uniform surface. If the wire is rough, or has high or low spots, there would result an objectionable wire mark which might even cause rejection of the sheet made on it.

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We can see, therefore, that not only must our materials be of the best, but that the utmost care and accuracy must be used in all stages of wire cloth manufacture.

Choosing the Right Materials

It would be a decided waste to put the utmost of manufacturing skill and accuracy into a Fourdrinier wire, only to find that the materials used would not stand up in service. Wire manufacturers, therefore, are constantly alert for new alloys that might be fabricated into better and more economical wire cloth. In the early days, low brass, ranging from 80-85% copper—15-20% zinc was adequate for both warp and shute in the Fourdrinier cloth. Machines were small, speeds slow, and corrosion generally a minor factor. Machines began to increase in size; they ran faster; stresses and strains on the wire multiplied. Corrosion entered the picture. In woven wire cloth the warp runs the length of the cloth while the shute runs across the width. Now brass for warp could no longer take the wear, fatigue, nor tension. It was a fairly easy step to the phosphor bronzes. By and large the wire weavers made the transition before the demand for it became critical. In fact one still finds an occasional all brass wire running somewhere and performing satisfactorily. Since the warp wire takes all the wear and tension as well as most of the fatigue, it was the first to be changed. The first phosphor bronze used was one containing around 6% tin, balance copper with phosphorus relatively uncontrolled. As casting practices improved it was found that a tougher wire could be made by using 8% tin and controlled phosphorous content without running into serious fabrication problems. Current Fourdrinier warp alloys are phosphor bronzes with tin from 7-8%, 0.2-0.3% phosphorus, and balance copper. On the whole, brass has remained satisfactory for the shute, or filler, and being more economical in cost as well as processing remains in general use. There are some isolated conditions of corrosion where a 3% tin bronze performs as shute more satisfactorily than does brass.

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Other materials have been considered from time to time for Fourdrinier use. Very early, stainless steel was considered and a number of wires were woven. It filled the bill as far as tensile strength, corrosion and abrasion resistance went but it could not stand up under the reverse bends encountered on the paper machine.

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All the stainless steels available in wire form today work hardened too fast. Fourdrinier wires made of these alloys fail by fatigue cracking long before they are worn out, resulting in a cost that cannot be justified when compared with the cost of bronze. This has also been found true of most other alloys tried. The silicon bronzes have good corrosion and fatigue resistance but abrasion resistance is not good enough. So the search goes on. Some of the rarer or more precious metals might meet physical requirements; tantalum, or a titanium alloy for ex-

ample; but price becomes prohibitive and, at the present time, these materials cannot compete economically. Fourdrinier wire manufacturers and metal producers continue the search for better alloys but so far Grade C Phosphor Bronze holds its own.

Wire for Weaving—A Precision Product

Now that we know the demands that the Fourdrinier wire must meet, we can better appreciate some of the precautions and safeguards taken in the various stages of wire fabrication. We can see that wire for weaving must be held to very close tolerances as to size and temper; closer tolerances than those required by the average commercial wire producer. Hence most of the larger Fourdrinier wire companies have their own wire mill turning out the sizes required for weaving under close control of their own inspectors. Raw wire is received in 100-200 lb. coils at 1/16 inch diameter or larger, fully annealed for redrawing. As soon as it is received, this wire is subjected to careful analysis. Representative samples of every shipment are examined chemically, metallurgically, and physically. If one of these samples does not meet specifications, the entire shipment may be rejected or at least given 100% inspection and the unsatisfactory material sorted out and replaced by the supplier.

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Having passed this initial inspection, the wire is processed on conventional drawing equipment to sizes required for weaving. These sizes range from about .020″ to as low as .004″. Since size specifications call for plus or minus .0001″ it is

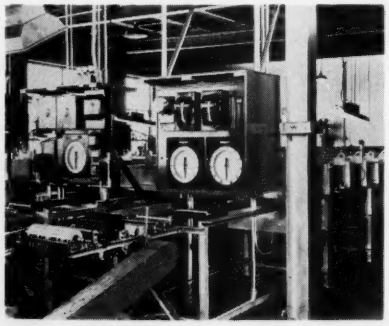

Fig. 3—Electric Furnace for the Annealing of weaving wire. Each strand of wire passes through an individual tube.

Fig. 1—Removing "Raw" wire from Storage for transfer to Wire Drawing Machines.

found advantageous to use diamond dies throughout and to maintain a Die Shop for keeping dies up to standard as well as for production of at least a portion of new die requirements. Finished wire is drawn onto steel spools holding 20 lbs. or more.

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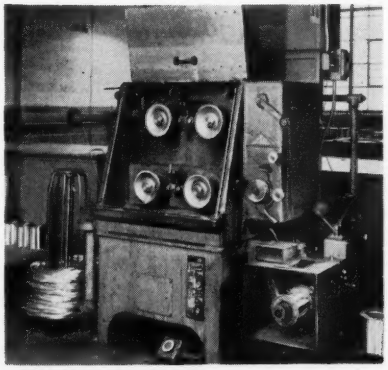

Fig. 2—High speed, low slip Wire Drawing Machine. Wire is drawn to finish size for weaving on these machines.

To be suitable for weaving, the hard drawn wire must be annealed. If weaving is to be uniform the degree of anneal, as determined by grain size and yield strength, must

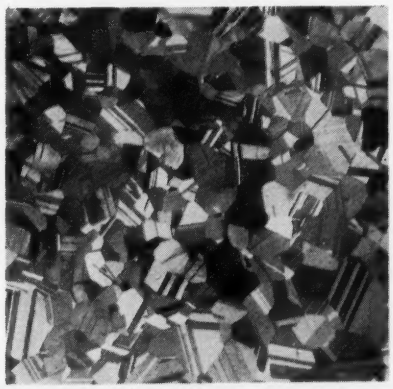

Fig. 4—A cross section Micrograph of annealed bronze wire showing the grain structure.

be held to very close tolerances. Surface, also, must be smooth and uniform. Wire is therefore annealed in tube furnaces. Each strand of wire passes through an individual tube in a reducing atmosphere to insure a smooth clean surface. Furnaces are electrically heated and temperatures are held within very close limits. The wire, as annealed, is wound on wooden spools holding approximately 4 lbs. Every spool is checked for size and elongation by an inspector. Representative samples are taken from production at intervals by the laboratory and checked for gauge, grain size, and other characteristics. If found within control limits, the spooled wire is sent to finished wire storage until needed for weaving.

The Loom

With wire of sufficiently high quality, we are now ready for weaving. Wire weaving looms have evolved from the old hand operated looms, very much like carpet looms, to the present power looms, each with its own individual motor for drive. As paper machines increased in width, looms have kept pace. The widest loom in the United States at the present time is slightly under 25 feet in width. So far no paper machine is projected in this country over this 300 inches. One or two do exist elsewhere, however, that are slightly over this figure.

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Warp wires, which will run the length of the finished cloth, are wound on a large grooved roll, called the beam roll, or simply the beam, at the back of the loom. Grooves are on one or two inch centers and are from one to two inches

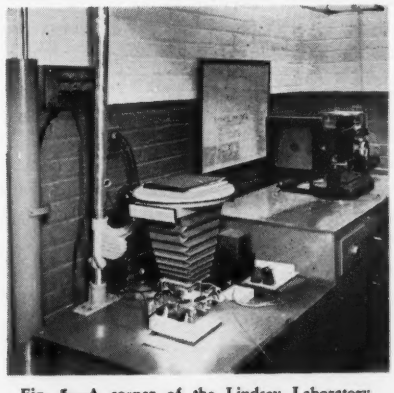

Fig. 5—A corner of the Lindsay Laboratory showing the Metallurgical Microscope and camera for Macro photography. Both individual strands as well as the finished cloth can be examined and photographed with this equipment.

deep. The number of strands of wire fed into each groove depends on groove width and the warp count of the cloth to be woven. With two inch grooves and 60 mesh cloth, 120 strands of wire would go into each groove. Wire must go on the beam under constant tension so that it will react uniformly during weaving. This tension is maintained by a device known as a Marshall. Each strand going onto a loom may be as much as a ¼ mile in length. A wide loom may require as much as 4000 miles of wire for a completely full beam, or a complete warp as the weavers term it. This 4000 miles of wire is sufficient to produce from 20 to 25 complete Fourdrinier wires, depending of course, on the length of the individual wires scheduled for the particular warp. Now that the beam is full, the loom must be "threaded up" before we can weave any cloth. First come the heddles, which are located in heddle frames that can be raised and lowered to form the opening, or "shed", through which the shuttle carrying the shute is fired during weaving. For regular, or plain weave, there are two heddle frames and every other heddle will be in the same frame resulting in the over one, under one, pattern of plain weave cloth. For semi-twill, or longcrimp, three heddle frames are needed and every third heddle is in the same frame. The three frames are shifted so that each warp goes consecutively over one shute wire and then under two. In threading up, each warp wire must go through its proper heddle. If we are threading up for a 60 count warp on a loom that is 240 inches wide, we will have 14,400 of these heddles to thread, if any wire should get into the wrong heddle, the pattern of the cloth would be spoiled necessitating a cutting down and rethreading. Following the heddles, the individual wire strands must be put through the reed. Reeds are made up of a large number of thin steel strips, or dents, bound together at the top and bottom. Reeds have the same number of dents per inch as the warp count of the cloth they are meant to weave; 60 dents for 60 mesh, 70 dents for 70 mesh and so on. The reed, then, gives the proper spacing to the warp wires. Also, the face of the reed is used to

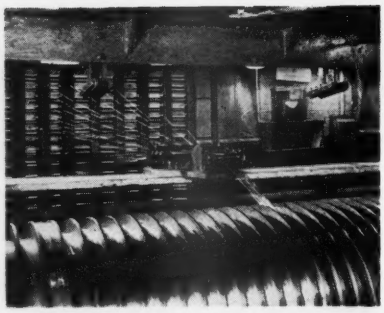

Fig. 6—Warp wire being "wound on" a loom beam roll. The Marshall (on board) feeds the wire evenly and maintains uniform tension.

drive the shute wire into place during weaving. As with the heddles, each warp wire must go through its proper space between dents or trouble will result. It can be seen, therefore, that preparing a loom for weaving is a time consuming, tedious operation. A complete "wind-on", including threading up, will take from two to three weeks. During this time the loom is out of production. It is easy to see from this why the wire manufacturer is reluctant to make something special—unless the customer is willing to contract for enough to warrant putting up somewhere near a full warp in the special item.

Weaving

The loom is now wound on, threaded up, and ready for weaving. Shute wire, the across the width or filler wire, is wound onto bobbins holding from around 4 ounces to as much as a pound of wire. Bobbins are placed in the shuttle and fired back and forth as the loom weaves cloth. Shute count is a result of balancing size of wire with tension maintained on warp strands and with the force of the blow struck by the reed face. Any appreciable variation in one or more of these factors will result in what we call "off mesh" cloth, the wrong shute count. It very often takes a foot or two of weaving when starting up a new warp to get all these things into the proper adjustment and produce the mesh count desired. Weavers check the mesh count and inspect the woven cloth at frequent intervals

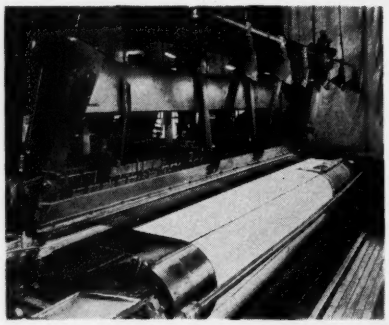

Fig. 7—A wire weaving loom in action.

to be sure that things are running smoothly. As the wire is woven it is rolled up on a cloth roll at the front of the loom. When the proper length has been woven, the wire is cut and transferred to a "cut out" pole for transportation to the Finishing Department.

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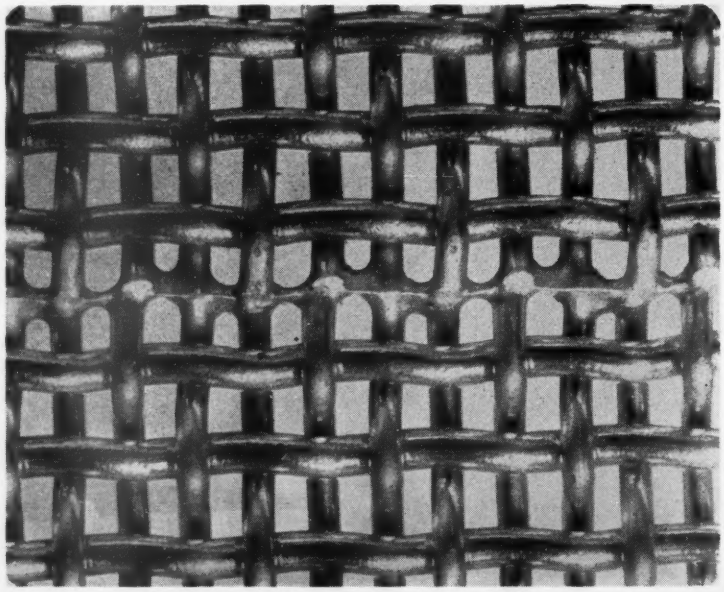
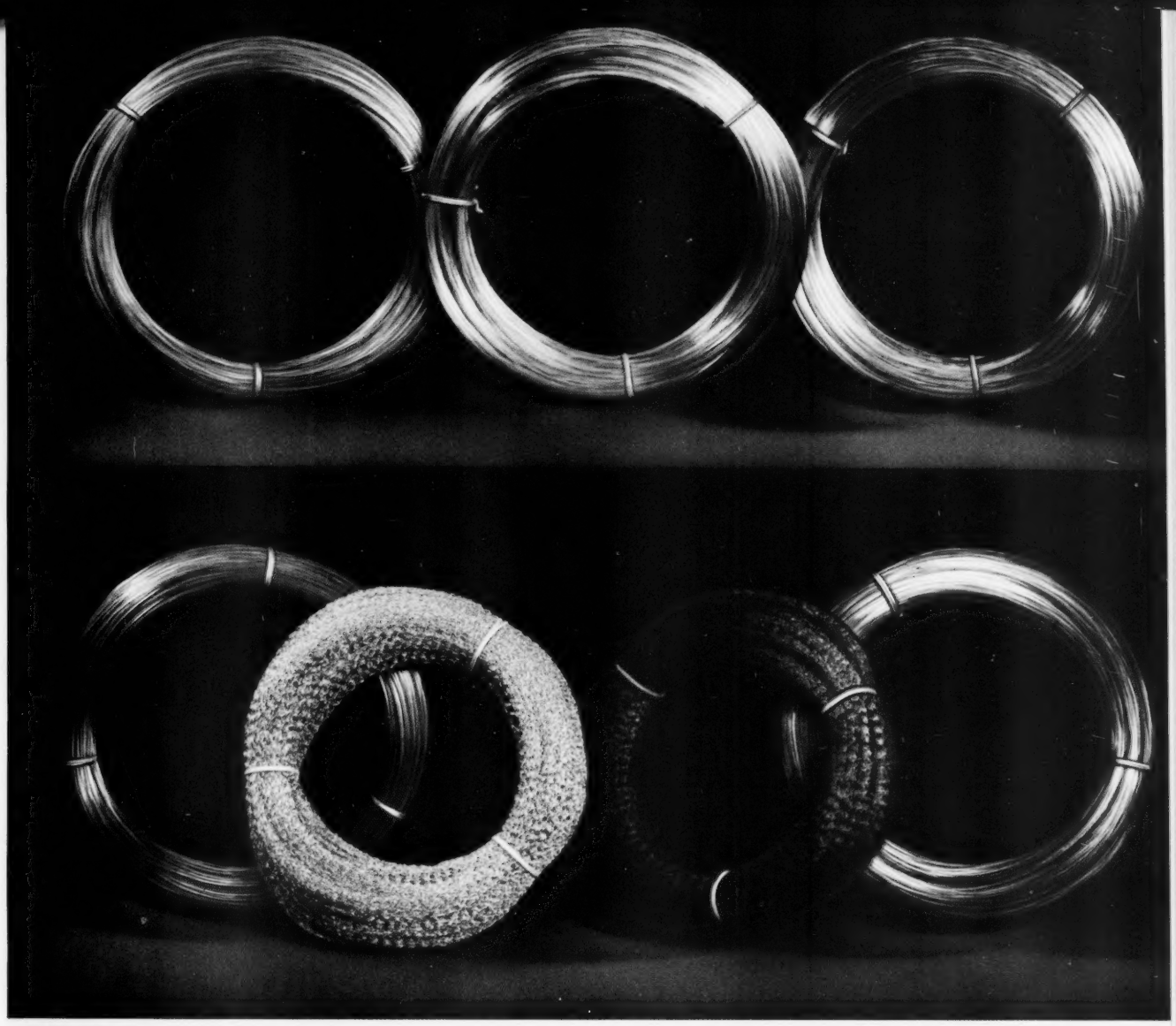


Fig. 8—A macrophoto of a brazed seam in semi-twill, or longcrimp, wire cloth.



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D

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Springing and Inspection

During the weaving operation the cloth takes a definite set, or curl. This curl must be taken out so that the cloth will lay flat and may be handled during the various finishing operations. This is done by springing, or pulling the wire cloth over a blade in opposition to this natural curl. After springing, the cloth is examined on an inspection table. Here it undergoes the first of a series of careful inspections. Length and width are checked against that called for by the order. The wire is then ready for seaming into the endless belt required for the paper machine.

Seams

Along with everything else, seams have come a long way since the early days. Originally, the ends of the wire belt were joined by sewing, or lacing with wire. At first brass and bronze were used for sewing wire, followed, in some instances, by stainless steel. As machines got wider and faster, sewed seams could not be made strong enough and also came to produce serious marks in the paper sheet. By and large the wire manufacturers were ahead of the demands. Brazed and welded seams were developed and were put into use because they were faster and more economical to make than were sewed seams. So by the time that the sewed seams became unsatisfactory, they were becoming obsolete for economic reasons. There remain a few, isolated cases, such as slow machines having one or more fairly small rolls, where sewed seams meet the conditions better than the present day brazed seams if the seam mark is not objectionable. A properly designed sewed seam has something of a hinged effect and takes the wrap around a small roll better than a brazed joint that tends to be slightly stiffer than the body of the wire.

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We mentioned brazed and welded seams. The two more or less grew up together and for a time both were produced. European weavers still use welded seams but American manufacturers have largely gone over to seams brazed with silver solder. Less heat is required for brazing, there is less cast material in the joint with the result that the brazed joint is stronger and more flexible than a welded joint. Seams must be as near like the rest of the cloth as is possible in drainage characteristics. The seam must not project above or below the plane of the cloth. Otherwise there will be a telltale mark in the sheet of paper. In severe cases the paper sheet is so weakened by the mark that breaks occur. If this happens, the paper machine cannot run continuously and the wire has to be cut off. The seam, then, while it covers an extremely small area, is very important. The seaming operation is one of literally microscopic precision. Microscopic inspections and continuing research keep Fourdrinier wire seams up to a constantly rising standard of excellence. The ideal seam would be one that could not be found, either in the wire or as a mark in the sheet of paper. This is closer to a reality than one might think!

Finishing and Packing

Having installed a seam that passes rigid inspection, we now have the wire ready for the stretchers. Basically, the stretcher is a big table having two rolls which can be placed at varying distances apart, depending on the length of wire to be placed on them. One of the rolls is driven and is also capable of being moved longitudinally in order to "stretch" the wire. Since the wire is an endless belt, the rolls are removable from the table. The wire is tented and the rolls inserted, set in their journals and placed the proper distance apart. On the stretcher rolls the wire is run around slowly and given another close inspection. Any slight irregularities in surface that might remain are smoothed down.

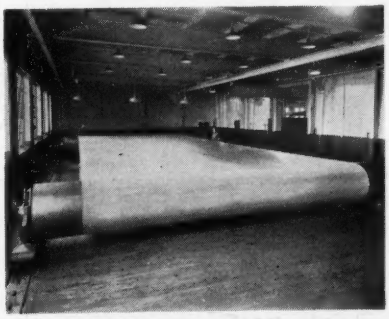

Fig. 9—A finished Fourdrinier Wire being inspected on the Stretcher.

The wire is then "stretched" to "mill length", that is, the length specified by the customer. "Stretching" does not mean actually stretching the individual warp strands. The gain in length comes by taking some of the slack out of the weave, making for a firmer cloth and a wire less likely to stretch out excessively while running on the paper machine, for wire cloth has considerable elasticity.

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To avoid overstretching, it is necessary to alternately pull the wire up, slacken it off, and check the length. No two wires have exactly the same elasticity so there is no set formula; each wire must be treated individually. Before coming off the stretcher, both cloth and seam receive a final going over. Seams are ideally finished slightly thinner than the body of the cloth to make sure that they do not project beyond the plane of the cloth. After final inspection, the wire is again tented and the stretcher rolls removed.

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The wire is then spread out flat on the stretcher floor and one last check of length and width made. Both sides are measured and must be within ⅛ inch of specified length. If measurements check, the wire is rolled up on three poles into a pyramidal bundle. The poles are secured by means of steel strapping and further locked into place by having blocks of wood nailed to the ends of the poles. The wire bundle is wrapped in heavy kraft paper provided with a rip cord so that the wrapping may be removed at the paper mill without the use of a knife or other sharp instrument that might cut the wire cloth. A specially constructed box is carefully inspected for possible slivers, nails, or other foreign objects that might damage the wire. A final wrap of crepe wadding is put around the wire bundle and the whole package is lowered into the box by means of rope slings which remain in the box for use in unpacking the wire at the paper mill. A piece of deadening felt is fitted over the top of the package as added protection and the box lid secured into place by means of screws. The box is then

"weighed out" and trucked to freight or truck terminal for shipment to the paper mill. In spite of all precautions in packaging, wires sometimes suffer damage in transit. It is to the advantage of all concerned, therefore, for the paper mill to open the box and inspect the shipment for concealed damage as soon as received so that if the wire is marked in some way, claim can be filed with the carrier promptly and arrangements made for the repair of the wire before it is needed for immediate installation on the machine.

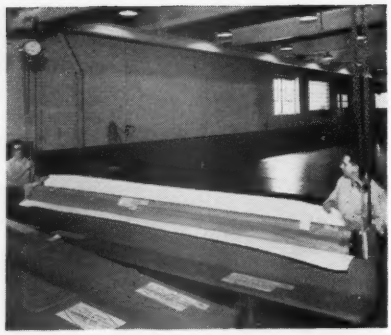

Fig. 10—Lowering the wrapped wire bundle into the shipping box. The outer wrap of crepe wadding cushions and protects the bundle.

Performance Data Wanted

One would think that with the wire out of the door and safely in the customer's hands, it would be all his from then on. Such is not the case. Careful operating records are kept, and any information as to how and why wires fail, whether prematurely or otherwise, is valuable. If some mill has a special problem, the wire manufacturer might be able to help and this might even result in an improvement that can be incorporated into regular production giving better wires for everybody. With information and samples of used wires coming in all the time, one can frequently get the jump on a problem before it develops to serious proportions. The wire manufacturer must keep in balance with the demands of the paper industry.

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As papermaking gets more complex the demands on the Fourdrinier wire gets heavier. Increasing speeds make for shorter and shorter life. A high speed machine can wear a wire out completely in a few days. The next increment of speed may cause such a sharp drop in life that the economically necessary extra tonnage cannot be realized. If wires cannot be made more wear resistant without sacrificing fatigue and other properties we will have reached the limit as far as speed is concerned.

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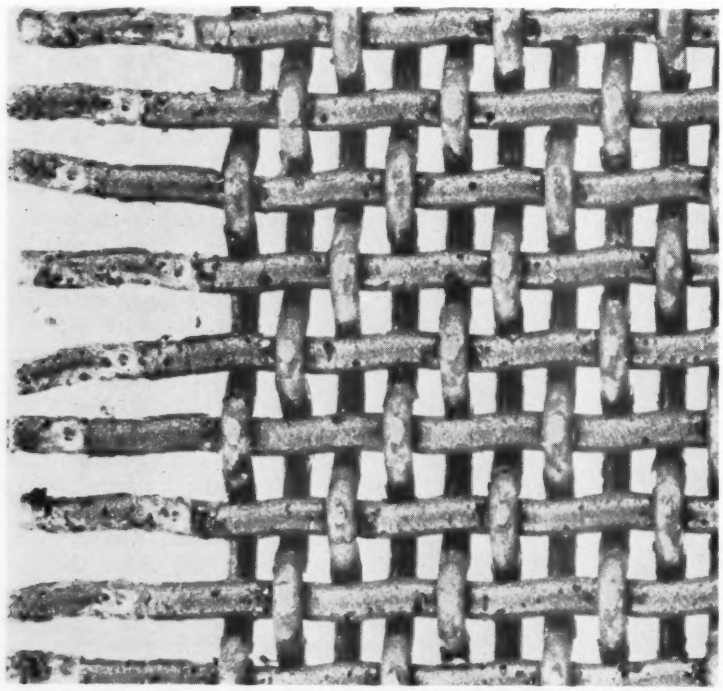

Fig. 11—A macrophoto of used wire cloth. Effects of corrosion (pitting and scale) are evident.

Some Complex Corrosion Problems

Earlier we mentioned that corrosion was a problem that was increasing in complexity. Corrosion problems have multiplied in the last few years. Any treatment condition that increases the dissolved solids content of the stock furnish increases the corrosion potential. Both for economic reasons and as a partial solution to pollution and waste disposal problems of the paper industry, more and more mills are re-using the water removed from the stock on the paper machine. This water often contains some of the chemicals used in cooking and processing pulp and often increases the corrosiveness of the stock furnish considerably. Some chemical methods of pulping, such as substituting ammonia compounds for sodium can lead to serious corrosion of the wire if the chemicals are not completely washed out.

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Just a few examples of what can happen. Seams have failed by galvanic attack. One would expect a silver solder to be more resistant to corrosion than either the bronze warp or the brass shute but under certain conditions the standard solder alloy becomes the anode in a galvanic couple and the seam in the wire disintegrates in a few days. This can be averted, once it is recognized that a particular mill has the condition, by coating the seam with a special plastic lacquer or by using a more noble brazing alloy. Another interesting case of galvanic corrosion is sometimes encountered on used Fourdrinier wire cloth. The warp and shute—both copper alloys—have been known to form a galvanic couple with brass shute acting as anode. In special cases where 3% tin bronze is used as shute, this alloy is more noble than the 8% tin warp and the warp becomes the anode in the couple. This in spite of the fact that copper alloys are generally considered compatible. Almost all types of corrosion have been found in used wire cloth at one time or another. There have been flare-ups of intergranular corrosion where the wire cloth is badly embrittled and literally breaks into pieces.

(*Please turn to page* 313)

EFFECT OF HEATING AT 300 AND 500°F. ON THE PROPERTIES OF ALUMINUM AND COPPER WIRES

by Allen S. Russell
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New Kensington, Pa.

With copper likely to be short for an indefinitely long period and with the supply of aluminum promising to become better within another year, this study of aluminum and copper as electrical conductors is of timely importance, since aluminum will be increasingly used in many places where copper was considered the standard metal. We are grateful to the author for the research work that has made possible this excellent paper.

The development of superior insulating materials is permitting such high temperatures in electrical equipment that the wire itself may have to be selected on the basis of its ability to withstand service temperatures. Because of its resistance to oxidation, aluminum would be expected to maintain electrical conductance in high temperature service in a superior fashion, but little direct information on this subject has been available. This paper reports a limited investigation of the effect of heating in air at 300°F. and 500°F. on the electrical and tensile properties of annealed copper and hard-drawn aluminum wires.

Experimental

The aluminum was hard-drawn electrical conductor grade wire produced by Aluminum Company of America and contained 0.04% copper, 0.28% iron, and 0.10% silicon. The copper was the commercial electrical conductor grade.

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Fifty 20-inch lengths of each of No. 18 (0.040 inch) and No. 29 (0.032 inch) copper and aluminum wires were assembled in bundles (eight in all) and placed in ovens at 300°F. (149°C.) and 500°F. (260°C.). Samples were removed from time to time for testing. Heating of the 500°F. samples was in ten intermittent cycles.

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The electrical conductance was measured by determining at constant current, the potential drop with a Leeds and Northrup K-2 potentiometer over a fixed length of wire at 20°C. as compared with the potential drop over a 0.001 ohm resistance certified by the National Bureau of Standards. The tensile properties were determined in an Amsler universal testing machine of 20,000-lb. capacity using the 200-lb. range. Yield strengths were measured by a Templin autographic extensometer at an offset of 0.2%. The procedures followed ASTM Standard Methods of Tension Testing of Metallic Materials (E-46), except that the elongation was measured in a gage length of four inches.

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All the values were based on the assumption that the wires retain their original cross sectional area. Actually an oxide film peeled off the copper wires after 500°F. heating.

Results

Values for electrical conductivity, tensile strength, yield strength, and elongation are shown as a function of heating time at 300°F. and 500°F. in Table I. (*See next page*)

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The hard-drawn aluminum wire was softened slowly at 300°F., the electrical conductivity increasing 2% in one year. Simultaneously the tensile strength decreased from 26,000 psi to 18,000 psi for No. 18, and from 27,000 psi to 16,000 psi for No. 20 wire, the decrease being essentially linear with logarithm of the heating period. The properties of the copper were not affected appreciably at 300°F. and both the copper and aluminum wires retained their original appearance in this treatment.

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In one day at 500°F. the electrical conductivity of the aluminum increased 2%, while the tensile strength decreased to 11,000 psi. The aluminum was not changed in appearance on heating. The electrical conductance of the copper diminished 8% for the No. 18 and 12% for the No. 20 wire in 286 days while the tensile strength diminished from 36,000 psi to 32,000 psi for the No. 18 and to 31,000 psi for the No. 20 wire. The copper was strongly oxidized at 500°F.

Discussion

At 300°F. oxidation is not a major factor for either copper or aluminum. The softening of the hard-drawn aluminum at this temperature causes a small increase in conductance and a considerable drop in tensile strength while the annealed copper is not affected appreciably. At 500°F. the copper becomes oxidized and it decreases both in conductance and strength. The aluminum is annealed rapidly at 500°F., but it is not oxidized significantly.

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If the usual rule is followed that No. 18 aluminum wire is used interchangeably with No. 20 copper, the following comparisons can be made. (*See Table 2 next page*)

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The decrease in conductance of No. 20 copper wire at 500°F. is shown as a function of time in Figure 1. It must be remembered that this test was not particularly severe, the atmosphere having no excess humidity and being devoid

TABLE I

Effect on Aluminum and Copper Wires of Heating in Air at 300°F. and 500°F.

Heating Time Days	Electrical Conductivity* Per Cent of Copper Standard				Tensile Strength* 1000 psi				Yield Strength* 1000 psi				Elongation % in 4" gage length			
	Aluminum		Copper		Aluminum		Copper		Aluminum		Copper		Aluminum		Copper	
	#18	#20	#18	#20	#18	#20	#18	#20	#18	#20	#18	#20	#18	#20	#18	#20
300°F. Heating																
0	61.7	61.7	100.7	100.7	26	27	36	36	24	25	13	16	2	2	45	46
1/144	61.8	61.8	--	--	25	26	--	--	24	25	--	--	3	2	--	--
1/24	61.9	61.9	--	--	24	24	--	--	24	24	--	--	2	2	--	--
1/4	62.0	62.1	--	--	24	24	--	--	23	23	--	--	2	2	--	--
1	62.1	62.3	--	--	23	23	--	--	22	22	--	--	2	2	--	--
4	62.4	62.5	--	--	22	21	--	--	21	20	--	--	3	2	--	--
20	--	--	--	--	21	20	--	--	20	18	--	--	3	3	--	--
91	62.5	62.7	100.6	100.5	19	18	37	36	19	17	14	14	2	6	43	44
186	62.6	62.9	100.9	100.9	19	17	37	36	17	16	14	15	2	7	42	42
286	62.4	62.6	100.3	100.4	18	16	37	36	18	15	15	14	3	9	43	44
376	62.6	62.9	100.5	100.5	18	16	37	36	17	15	19	14	3	10	42	44
500°F. Heating																
0	61.7	61.7	100.7	100.7	26	27	36	36	24	25	13	16	2	2	45	46
1/144	62.3	62.4	--	--	17	13	--	--	15	11	--	--	6	12	--	--
1/24	62.5	62.5	--	--	12	12	--	--	8	8	--	--	25	26	--	--
1/4	62.5	62.6	--	--	12	12	--	--	8	8	--	--	30	28	--	--
1	62.7	62.7	--	--	12	11	--	--	7	7	--	--	31	30	--	--
4	62.9	62.8	--	--	12	11	--	--	7	7	--	--	32	31	--	--
10	--	63.0	--	99.1	--	11	--	35	--	7	--	16	--	30	--	35
30	62.3	--	99.0	--	11	--	35	--	8	--	12	--	31	--	43	--
90	62.5	62.9	97.2	95.6	11	11	34	34	6	6	13	12	32	28	44	41
180	62.8	63.0	96.3	93.6	11	11	34	33	8	8	12	12	34	30	40	36
286	63.0	63.1	92.8	88.9	11	11	32	31	6	6	11	10	32	33	39	35

* Based on the assumption that the wires retained their original cross sectional area. An oxide film, which subsequently peeled off, formed on the copper wires at 500°F. and reduced their cross sectional area.

Table II

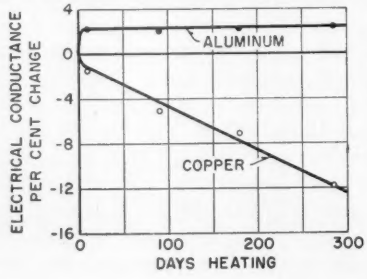
	Electrical Conductance Relative Units		Tensile Strength Relative Units	
	#18 Aluminum	#20 Copper	#18 Aluminum	#20 Copper
Original	0.96	1.00	1.11	1.00
After 376 days at 300° F.	0.98	1.00	0.78	0.99
After 268 days at 500° F.	0.98	0.88	0.49	0.85

of corrosive gases. Furthermore, the wire was not heated and cooled very many times, a factor which would probably accelerate corrosion by causing the oxide to flake from the wire. The aluminum would be expected to maintain its high conductance even in high humidity or certain corrosive atmospheres. Nonetheless, it is evident that the copper is losing conductance at an appreciable rate at 500°F. while the aluminum is not being changed in this respect.

Summary

Copper and aluminum wires have been exposed to air for one year at 300°F. (149°C.) and nine months at 500°F. (260°C.) to determine their relative utility as electrical conductors at temperatures which might be encountered with new type insulation. Oxidation was not an important factor for either metal at 300°F. At 500°F. No. 20 copper decreased 12% in conductance and 15% in tensile strength in nine months and much oxide peeled from the surface. No. 20 hard-drawn aluminum wire was softened slowly at 300°F. and rapidly at 500°F. so that its electrical conductance increased 2% and its tensile strength was reduced 40% at 300°F. and 60% at 500°F. The aluminum wire showed no significant oxidation at 500°F.

Fig. 1.—Electrical Conductance of No. 20 Aluminum and Copper Wires Heated in Air at 500° F.



Beryllium Copper Wire: Property and Design Considerations

by John T. Richards, Development Engineer
The Beryllium Corporation
Reading, Pennsylvania

Part II

This is the second installment of the article on beryllium copper wire prepared by Mr. Richards. The first which appeared in the February issue of WIRE AND WIRE PRODUCTS was concerned with the processing and applications of the alloy and this, with its engineering properties. The author has done an unusually fine job in the presentation of his subject and it should prove of great practical value to both user and prospective user of beryllium copper wire.

A knowledge of the engineering properties of beryllium copper wire is important in order to take full advantage of its useful characteristics. The following sections cover available data on the physical, mechanical and corrosion-resistant properties of this alloy. In addition, certain design features are considered, since a modified design may prove more advantageous than merely making a direct substitution of another material with beryllium copper.

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To illustrate the influence of beryllium content on the strength and conductivity of copper wire, Fig. 1 is presented. As indicated, an increase in beryllium causes a drop in conductivity and an increase in strength for both the annealed and cold drawn conditions. Alloys containing over 1 per cent beryllium respond to precipitation hardening, so that the strength and conductivity of these alloys are further improved through heat treatment. Since existing specifications for beryllium copper wire call for 1.80-2.05 per cent beryllium, property data which follows refer to this range unless otherwise stated.

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Physical Properties

Typical physical property data for beryllium copper wire are listed in Table I. The influence of cold drawing and heat treatment upon density is shown in Fig. 2 and, as expected, the density decreases steadily with cold work. Note especially the increase in density upon heat treating, causing a decrease in length.

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Electric and thermal conductivity values for heat treated wire are given in Table II. Both electrical and thermal conductivity increase substantially during heat treatment. Maximum conductivity is attained by overaging (aging at higher temperatures or longer times than necessary for peak hardness), as indicated by Fig. 3.

Mechanical Properties

Perhaps the most significant properties from a specification standpoint are those obtained from the usual tension test. Although there is frequently little basis for so doing—ultimate tensile strength, yield strength, proportional limit and elongation—are frequently employed for comparing different wire materials. Furthermore, yield strength and proportional limit are sometimes used in determining working stresses for statically loaded applications. The influence of cold work and heat treatment upon typical tension properties of beryllium copper wire is shown in Table III. In most cases, commercial tempers for heat treatable wire are limited to solution annealed (A) and half (1/2 H) or three-quarter (3/4 H) hard.

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It should be noted that yield strengths listed in Table III are dependent upon test method. Values qualified by 0.01 or 0.2 per cent offset are useful in establishing working limits based on small amounts of deviation from an elastic condition. Although the yield strength obtained at 0.5 per cent strain or extension under load is frequently specified for copper-base alloys, it cannot be used as a criterion of plastic damage for beryl-

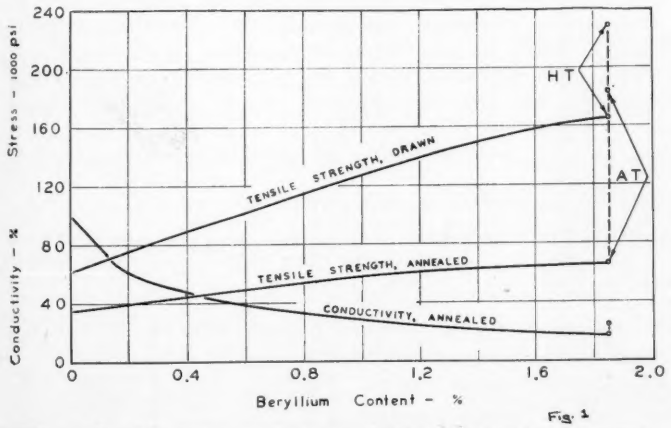

Fig. 1

Effect of beryllium content on strength and electrical conductivity of annealed and drawn (75% Reduction) beryllium copper wire. The change in properties due to age hardening is indicated for a 1.85% Be alloy. Date presented by Bassett (1) modified.

TABLE I.—TYPICAL PHYSICAL PROPERTIES OF BERYLLIUM COPPER WIRE IN THE HEAT TREATED CONDITION

Specific gravity		8.33
Density, lb./cu. in.		0.301
Magnetic properties		Non-magnetic
Melting range, F.		1600-1800
Specific heat, cal./g./°C.		0.10
Max. increase in density on heat treatment, %		0.6
Max. decrease in length on heat treatment, %		0.2
Poisson's ratio		0.33
Thermal expansion coefficient		
Per °C:	20-100 C.	0.0000167
	20-200 C.	0.0000170
	20-300 C.	0.0000178
Per °F:	68-212 F.	0.0000093
	68-392 F.	0.0000094
	68-572 F.	0.0000099

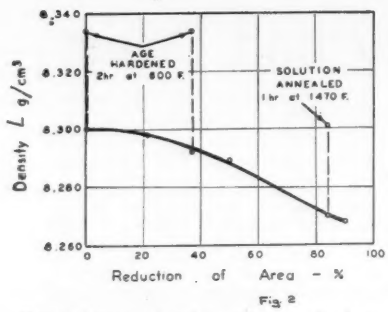

Fig. 2

The influence of cold work, age hardening and solution annealing on the density of beryllium copper wire.

* * *

lium copper. As shown in Table III, the proportional limit exceeds this yield strength for heat treated wire, consequently the entire specified strain can be performed elastically. Since the proportional limit is dependent upon the sensitivity of the test method, it is specified herein as the stress occuring at 0.002 per cent offset. It can be assumed that the elastic limit (based upon 0.002 per cent permanent set) is roughly equivalent to the proportional limit.

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In considering elongation, the influence of diameter and gage length must be taken into account. As indicated in Table IV, the elongation decreases with wire size for cold drawn material (2). At the same time, elongation decreases with increasing gage length (see Fig. 4), so that ductility comparisons should be limited to wire of the same diameter and gage length. Since hardness tests are applied only infrequently to wire, values are not included. Typical torsion test results from various sources are included in Table V.

Effect of Cold Work and Fabrication

The influence of cold work, whether by drawing or fabricating, is marked. Fig. 5 shows that cold drawing increases the tensile strength, yield strength and proportional limit of heat-treatable wire with a decrease in elongation. Although commercial tempers rarely exceed 50 per cent, the data presented for greater reductions may be applicable to wire that is severely cold formed during fabrication. A similar trend is apparent in homogenized and drawn or pretempered wire (see Fig. 6).

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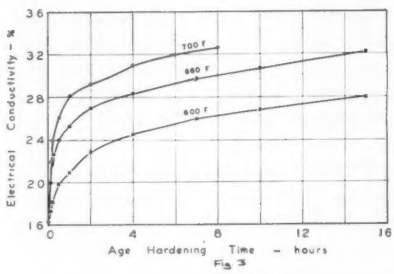

Fig. 3

The effect of age hardening time and temperature on the electrical conductivity of beryllium copper wire (¾ H).

* * *

Excessive cold reductions can be expected to cause preferred orientation, which is not completely removed by solution annealing. Although this condition causes higher tensile properties with decreased conductivity and elongation in annealed wire, subsequent moderate reductions (37-50 per cent) largely remove this effect. Consequently, heavy reductions may be applied during breakdown, provided the wire is supplied in half or three-quarter hard tempers. When furnished in the annealed condition, a moderate rather than heavy reduction should preceed the final anneal, otherwise a marked preferred orientation will result.

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Straightening solution annealed wire causes a substantial increase in the tensile strength and proportional limit with a corresponding decrease in elongation. In the case of wire drawn 20 per cent or more, this tendency is reversed, thereby causing a decrease in strength and an increase in elongation. For example, the ultimate tensile strength of three-quarter hard (¾ H) wire may be reduced 5,000-10,000 psi by straightening due to the stress-relieving tendency of this operation.

Effect of Heat Treatment

For a given heat treating temperature, the tensile properties of heat treatable wire increase with time to a maximum, then drop off with further aging time. Increases in temperature speed up the aging rate, so that at 700 F. maximum properties, may be attained in 20 minutes, whereas 2 hours may be required at 600 F. The time-temperature relationship for three-quarter hard wire is shown in Fig. 7 For annealed wire somewhat longer times (approximately 50 per cent) may be required to reach maximum

TABLE II.—ELECTRICAL AND THERMAL PROPERTIES OF BERYLLIUM COPPER WIRE

		Heat Treatable	Heat Treated	Pretempered
Electrical properties				
Conductivity, % IACS, 20 C.		15-19	22-30	21-23
Resistivity, microhm cm., 20 C.		11.4-9.0	7.8-5.7	8.2-7.5
200 C.		-	9.4-6.8	-
Temperature coefficient of resistivity, 20-200 C.		-	0.0009	-
Thermal properties				
Conductivity, Btu/sq ft/ in/hr/°F.,	68 F.	-	750-900	-
	392 F.	-	900-1100	-
Cal/sq cm/cm/sec/°C.,	20C.	-	0.26-0.31	-
	200 C.	-	0.32-0.37	-
Temperature coefficient of thermal conductivity, 20-200 C.		-	0.0012	-

TABLE III.—TYPICAL TENSILE PROPERTIES OF BERYLLIUM COPPER WIRE

	Solution Annealed		Quarter Hard		Half Hard		Three-quarter Hard		Pretempered
Heat treated, hours at 600 F.	0	3	0	2	0	2	0	2	0
Condition	A	AT	1/4 H	1/4 HT	1/2 H	1/2 HT	3/4 H	3/4 HT	PT
Average cold drawn reduction, %	0	0	21	21	37	37	50	50	*
Tensile Strength, psi	58-78,000	165-185,000	90-115,000	180-210,000	110-135,000	190-220,000	130-155,000	195-230,000	145-205,000
Elongation in 2 in., %	35-60	4-10	8-20	3-8	2-8	2-6	1-5	1-4	1-3
Proportional Limit, 0.002% Offset, psi	13-23,000	110-140,000	40- 55,000	130-160,000	55- 75,000	135-165,000	70- 95,000	140-170,000	105-140,000
Yield Strength, 0.2% Offset, psi	20-35,000	140-170,000	65- 80,000	170-200,000	90-115,000	180-210,000	110-140,000	185-220,000	135-195,000
0.01% Offset, psi	15-27,000	115-150,000	45- 60,000	135-170,000	60-85,000	140-175,000	75-110,000	145-180,000	110-150,000
0.5% Strain, psi	25-40,000	90-100,000	40- 60,000	85-100,000	70- 85,000	80- 95,000	70- 85,000	80- 95,000	80- 90,000

* Varies with wire size.

TABLE IV.—EFFECT OF DIAMETER ON THE ELONGATION OF COLD DRAWN BERYLLIUM COPPER WIRE (2)

Diameter, in.	Elongation, %
0.167	5.0
0.118	3.0
0.079	3.0
0.063	2.5
0.059	2.0
0.047	2.0
0.039	1.5
0.032	1.0

properties. It should be pointed out, however, that the values obtained will be somewhat less than those possible with fully heat treated cold drawn stock.

Effect of Temperature

As previously illustrated in Fig. 7, prolonged heating in the age-hardening range causes overaging with some loss of strength and hardness. Tests conducted at room temperature following heating do not, however, give a true picture of high temperature properties. The effect of time and temperature upon ultimate strength is perhaps best indicated by stress-rupture curves, such as those presented in Fig. 8. These curves show that when tests are conducted at temperature, there is some loss of strength with time, even at 390 F.

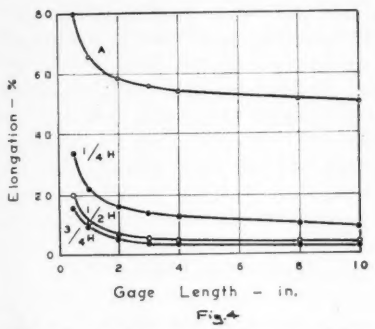

Fig. 4

The influence of temper and gage length on the elongation of beryllium copper wire.

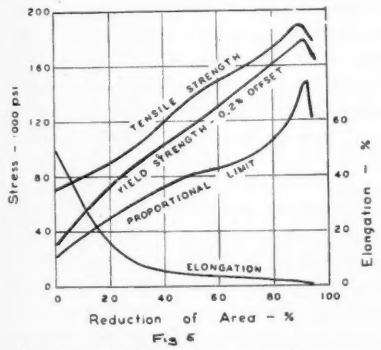

Fig. 5

The effect of cold drawing on the tensile properties of solution treated beryllium copper wire.

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In springs and similar applications, where external loading causes a stressed condition, operating temperatures are limited by relaxation or creep (drift). Relaxation is the loss of load with time in a constantly deflected spring and is caused by the reduction in elastic strength at increased temperatures. Creep or drift can be considered as the increase in length or deflection with time under constant load and also results from decreased elastic strength at elevated temperatures.

TABLE V.—TYPICAL TORSION PROPERTIES FOR BERYLLIUM COPPER WIRE

Source	Condition	Proportional Limit psi	Modulus of Rupture psi
Wright Field (3)	AT	95,000*	110,000
Tinius Olsen (Unpublished data)	A	17,900	72,600
	AT	63,600	131,000
	1/2 H	50,900	100,500
	1/2 HT	73,200	149,700

* Yield Strength

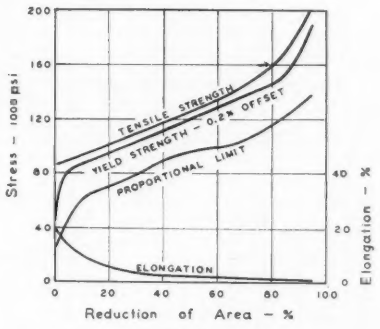

Fig. 6

The influence of cold drawing on the tensile properties of homogenized beryllium copper wire (PT).

For heat treated beryllium copper wire, maximum service temperatures should be limited to 300 F.,

TABLE VI.—EFFECT OF SUBZERO TEMPERATURES (6)
(Beryllium copper wire, 0.078 in. diam., with 2.5% Be)

	Temperature, F.	Tensile Strength, psi	Elongation, %	Reduction of Area %
Unhardened	+68	88,200	20.2	58.3
	-94	98,700 (+12%)	22.0 (+8.9%)	68.7 (17.8%)
Heat Treated (160 min. at 554 F.)	+68	154,300	2.2	25.2
	-94	168,700 (+9.2%)	2.9 (+31.8%)	39.8 (+58%)

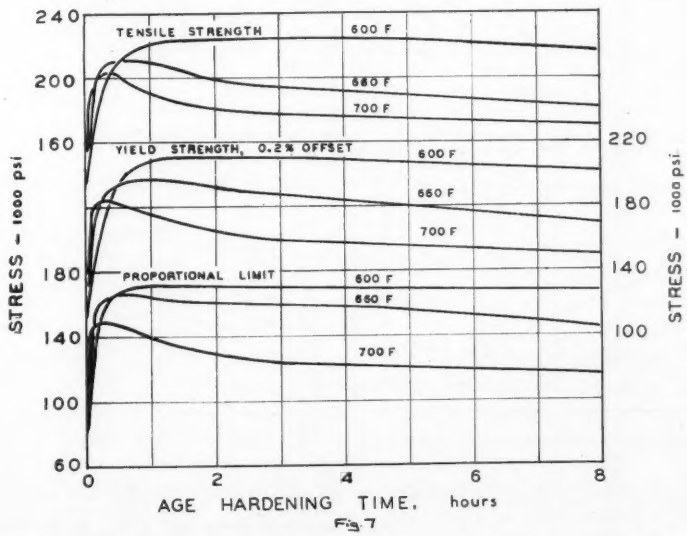

Fig. 7

The effect of age hardening time and temperature on the tensile properties of beryllium copper wire (¾ H).

TABLE VII.—AVAILABLE FATIGUE DATA FOR BERYLLIUM COPPER WIRE

Type Test	Source	Material	Condition	Cycles, in millions	Fatigue Limit, psi
Rotating beam	5	2.38% Be, 0.562 in. diam.	AT (2 hr. at 520 F.)	300	30,000
			Same but with 60° V notch	300	16,000
	9	2.0% Be, 0.022 in. diam.	3/4 HT (1 hr. at 700 F.)	10	51,000
	10	1.86% Be, 0.125 in. diam.	3/4 H	10	37,000
		1.84% Be, 0.020 in. diam.	PT (pretempered)	10	50,000
		1.84% Be, 0.020 in. diam.	3/4 HT (2 hr. at 600 F.)	10	55,000
Rotating-wire arc	7	2.25% Be, 0.037 in. diam.	3/4 H	100	51,500
	8	2.25% Be, 0.037 in. diam.	3/4 HT (Overaged)	100	54,000
Torsion	3	2.38% Be, 0.25 in. diam.	AT (2 hr. at 520 F.)	100	30,000 (0-max.)
			Same	100	16,000 (Reversed)
			Same but with 60° V notch	100	26,000 (0-max.)
	11	2.0% Be	3/4 HT (1 hr. at 572 F.)	2	24,200
		2.3% Be	3/4 HT (30 min. at 572 F.)	2	24,200
Compression spring	3	2.38% Be, 0.562 in. diam.	AT (2 hr. at 520 F.)	1	37,000
	8	2.0% Be, 0.040 in. diam.	3/4 H	32	55,000
			3/4 HT (2 hr. at 600 F.)	29	55,000
			3/4 HT (Overaged)	21	65,000
	13	2.0% Be, 0.040 in. diam.	3/4 H	100	55,000
			3/4 HT (2 hr. at 600 F.)	100	53,000
			3/4 HT (Overaged)	100	58,000
			3/4 HT (Underaged)	100	63,000
	12	2.5% Be, 0.110 in. diam.	3/4 HT	10	41,000
	14	2.0% Be, 0.148 in. diam.	3/4 HT (1 hr. at 625 F.)	10	20-40,000
			Same but shop peened	10	20-60,000
			Same but peened and relieved 1 hr. at 400 F.	10	22-78,000

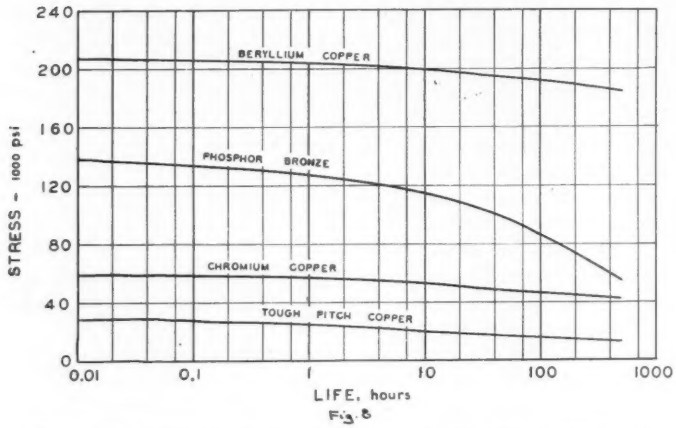

Fig. 8

Stress rupture curves for several copper alloys in wire form at 390 F. (5).

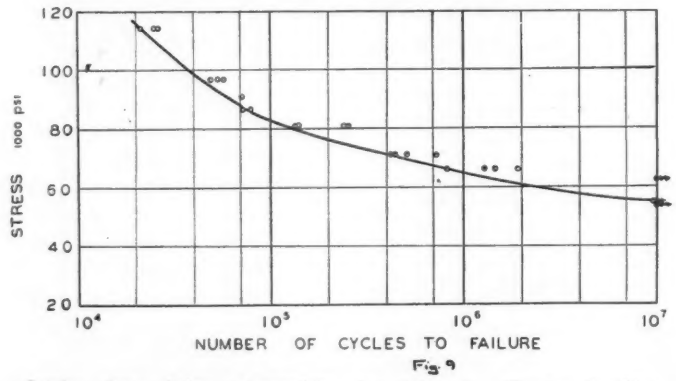

Fig. 9

Rotating beam fatigue characteristics for 0.020 in. diameter beryllium copper wire in the ¾ HT (age hardened) condition (10).

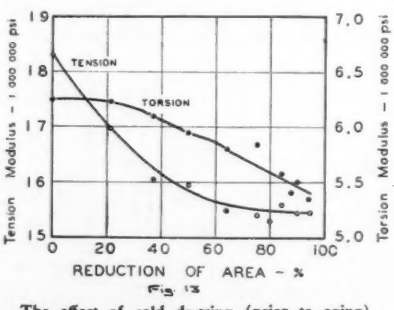

Fig. 13

The effect of cold drawing (prior to aging) on the tension (E) and torsion (G) moduli of beryllium copper wire.

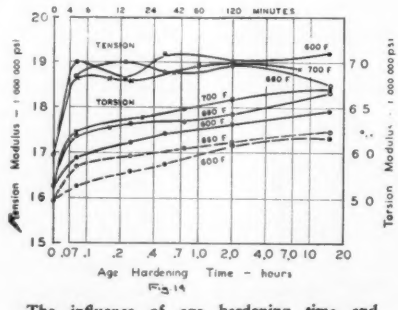

Fig. 14

The influence of age hardening time and temperature on the modulus of beryllium copper wire (¾ H). Tension moduli from stress-strain curves and torsion moduli from torsion pendulum tests. The effect of pendulum length is indicated (solid line for 16 in. length, broken line for 8 in. length).

unless some allowance is made in design stresses. On account of the high degree of cold work in pretempered wire, operating temperatures average 50-75 deg. F. lower for the same degree of relaxation.

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Recent data on the effect of subzero temperatures on the properties of beryllium copper is lacking. In 1933, Walle (6) reported the values listed in Table VI for annealed wire with a beryllium content of 2.5 per cent. From this work, it is apparent that temperatures of the order of —94 F. cause no embrittlement and, in fact, produce an increase in ductility as well as strength.

Fatigue

The fatigue strength of beryllium copper wire in various conditions has been checked by a number of different methods and the results are summarized in Table VII. These include rotating beam, rotating-wire arc, torsion and compression spring fatigue tests. In both the rotating beam and the rotating-wire arc methods, the specimen is subjected to reversed bending. It is of interest to note that in the work reported by Zimmerli (14), shot peening increases the stress range by approximately 100 per cent, while stress relieving for ½ hour at 400 F. gives a further 50 per cent improvement.

★ ★ ★

In recent unpublished work by Votta (10), the endurance limit has been established for 0.020 in. diameter wire in both the heat treated (¾ HT) and pretempered (PT) conditions by a new rotating beam method, described elsewhere (15). The S-N diagrams are shown in Figs. 9 and 10, while for comparison other property data for these lots of wire are included in Table VIII.

Anelastic Characteristics

Anelastic behavior generally includes such phenomena as permanent set, hysteresis, drift or creep, recovery, and damping or internal friction. Beryllium copper is frequently specified for certain precise applications by virtue of its excellent resistance to anelasticity. This quality is believed due to the alloy's high elastic strength and its heat treatable feature which permits stress relieving concurrent with hardening in the aging range. By eliminating to a large extent residual stresses resulting from fabrication,

a high degree of stability is obtained, which means reduced drift or hysteresis. In tests conducted on compression springs, Winter (12) has shown the marked elastic superiority of beryllium copper over phosphor bronze. Fine (16) has demonstrated by means of torsion pendulum measurements that beryllium copper has low internal friction or damping capacity, and this value is further reduced by heat treating.

Stress-Strain Relationships

To give a better picture of the elastic and plastic characteristics of beryllium copper, typical stress-strain curves in tension (Fig. 11) and torsion (Fig. 12) are presented. The relationships shown are the average of a number of stress-strain tests and are intended to provide approximate data.

Elastic Modulus

Elastic modulus is frequently considered as a physical constant for a given metal or alloy, but in reality it is a mechanical property and varies like strength or hardness, although to a lesser degree, with cold work or heat treatment. Fig. 13 indicates that both tension (Young's) and torsion (rigidity or shear) moduli decrease with cold work induced by drawing. Precipitation hardening has been shown by Masing and Haase (17) to cause a substantial increase in modulus as the result of gamma phase precipitation combined with stress relief. Recent tests illustrate this trend for ¾ HT wire (Fig. 14). Tension modulus values (E) are taken from tension stress-strain curves, while torsion moduli (G) results from torsion pendulum tests.

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Modulus values are also dependent upon the test method and stress level employed in their determination. In the case of torsion pendulum tests, the holding clamps induce localized internal stresses which affect values obtained. This becomes evident when the length of the pendulum is changed (Fig. 14, torsion moduli at 600 and 660 F.). Not unlike other materials, the modulus of beryllium copper decreases with increasing stress. This effect plus the influence of overstraining is illustrated in Fig. 15.

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TABLE VIII.—CHARACTERISTICS OF BERYLLIUM COPPER WIRE EMPLOYED IN FATIGUE TESTS GIVEN IN FIGS. 9 and 10.

	Heat Treated ¾ HT	Pretempered PT
Diameter, in.	0.020	0.020
Heat treatment	2 hr. at 600 F.	None
Composition		
Beryllium	1.94	1.94
Cobalt	0.23	0.23
Copper	balance	balance
Tensile strength, psi	223,900	203,600
Yield strength, 0.2% offset, psi	213,700	191,000
0.01% offset, psi	177,600	147,000
0.5% strain, psi	92,700	84,800
Proportional limit, 0.002% offset, psi	164,800	138,200
Tension modulus, psi	18,390,000	16,460,000
Torsion modulus, psi	6,770,000	6,100,000
Elongation in 2 in., %	1	1
Electrical conductivity, % IACS	22.5	22.5

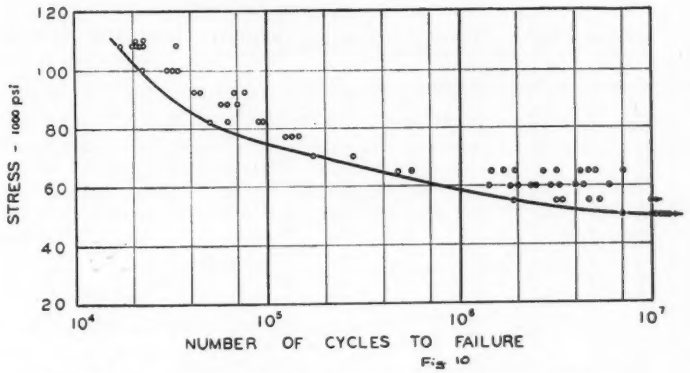

Fig. 10

Rotating beam fatigue characteristics for 0.020 in. diameter beryllium copper wire in the PT (pretempered) condition (10).

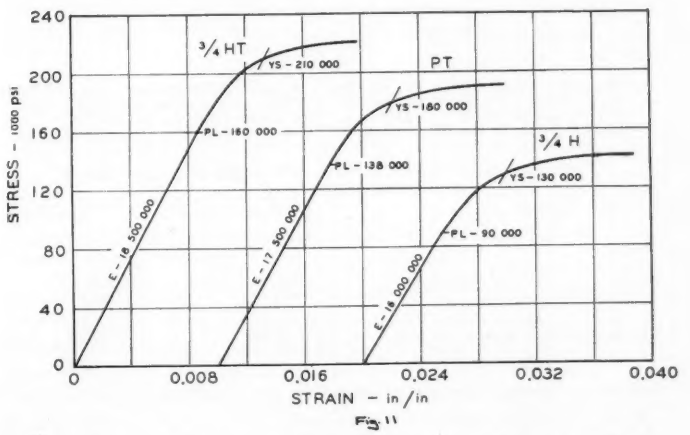

Fig. 11

Typical tension stress-strain curves for 0.020 in. diameter beryllium copper wire in cold drawn (¾ H), age hardened (¾ HT) and pretempered conditions (PT).

In addition, modulus is dependent upon temperature—decreasing with increasing temperature. Since this trend is reversible, the modulus increases again at the same rate when the temperature decreases. To determine the effect of temperature from —100 to +400 F., tests were conducted on compression springs and the torsional modulus calculated from the deflection rate. The rate of change, known as temperature coefficient of modulus or thermoelastic coefficient, is given in Table IX, along with other modulus data for beryllium copper wire.

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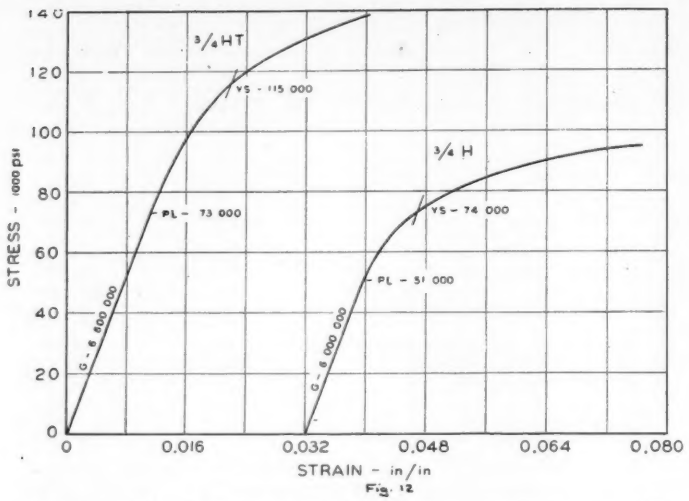

Fig. 12

Typical torsion stress-strain curves for beryllium copper wire in cold drawn (¾ H) and age hardened (¾ HT) conditions.

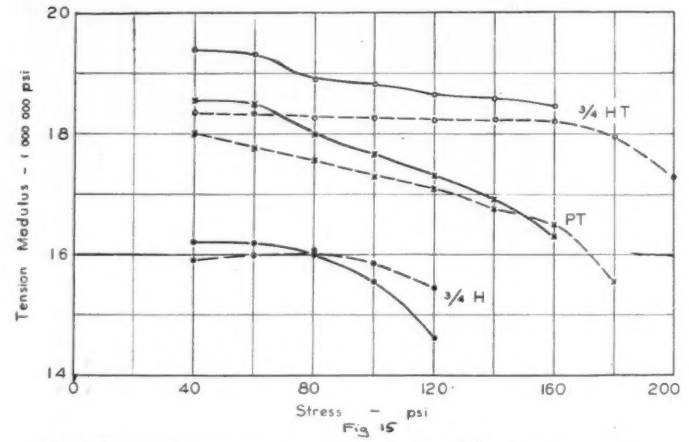

Fig. 15

The influence of stress on the secant tension modulus from zero to the stress indicated for 0.020 in. diameter beryllium copper wire in the cold drawn (¼H), age hardened (¾ HT) and pretempered (PT) conditions. Solid line for initial tension test to maximum load shown, broken line for second loading.

TABLE IX.—TYPICAL MODULUS VALUES FOR BERYLLIUM COPPER WIRE

Condition			Tension Modulus E at 20 C. psi	Tension Modulus Thermoelastic Coefficient	Torsion Modulus G at 20 C. psi	Torsion Modulus Thermoelastic Coefficient
A 1/2 H or 3/4 H	Solution annealed	Cold drawn	18,000,000 16,000,000	- -	6,300,000 5,800,000	- -
AT 1/2 HT or 3/4 HT	Solution annealed & heat treated	Cold drawn & heat treated	19,000,000 18,500,000	- -	6,600,000 6,500,000	- -
PT	Pretempered		17,500,000	-	6,100,000	-
3/4 HT	Keulegan & Houseman (18), -50 to +50C.			0.000350	-	0.000334
3/4 HT	Richards (recent)	-60 to +50C.		-	-	0.000370
		-70 to 0C.		-	-	0.000389
		0 to 100C.		-	-	0.000355

For design purposes, E and G can be considered to vary approximately 1% for each 50°F. change in temperature, from -100 to +260 F.

TABLE X.—CORROSION TESTS ON (BERYLLIUM) COPPER WIRE (1)
(Loss in grams per square inch)

Beryllium, %	Salt Spray End of One Month	Interrupted alternate immersion at 60 C. at end of 96 hours 10% H_2SO_4	10% HCl	Sea Water
0.00	0.011	0.502	0.138	0.012
0.07	0.009	-	-	-
0.20	0.007	-	-	-
0.41	0.009	-	-	-
0.91	0.010	0.433	0.170	0.012

Corrosion Resistance

In general, beryllium copper resists corrosion in a manner similar to other high-copper alloys. Under normal conditions it offers good resistance to rural and marine atmospheres, fresh and salt water, most alkaline solutions and some acids. Although beryllium copper alloys will in time stain and darken like copper when exposed to humid or sulfur-bearing atmospheres, tarnish does not noticeably affect mechanical properties. The resistance offered to warm and humid air indicates good service in tropical environments.

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Beryllium copper has poor resistance to certain compounds of ammonia, sulfur and mercury. In acids, its behavior greatly depends upon oxidizing conditions, comparing with deoxidized copper in this respect. Increases in temperature, concentration, aeration and agitation usually accelerate corrosion, often to a rather high degree.

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Combinations of either static or dynamic loading with corrosion are not harmful unless beryllium copper is subject to direct chemical attack by the corrosive media in an unstressed condition. Consequently, stress corrosion cracking (season cracking) is not a factor, while the combined action of corrosion and alternating stress (corrosion-fatigue) has no effect upon normal endurance properties.

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Dezincification and hydrogen embrittlement apparently do not occur. Because of the high volatility of beryllium halides, beryllium is lost from the surface of the alloy by selective attack when exposed to halogens (fluorine, chlorine, bromine and iodine). Since this is especially true at elevated temperatures. beryllium copper should not be used where exhaust gas from bromine-treated tetraethyl lead gasoline is present.

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There is little corrosion data available referring specifically to beryllium copper wire, since most of the work to date has been applied to other forms. Bassett (1) has reported results from several tests covering alloys of low beryllium content and

(*Please turn to page* 304)

A GOOD MEETING TO ATTEND—

THE PITTSBURGH REGIONAL MEETING

of the

WIRE ASSOCIATION

MAY 8-9, 1952, WILLIAM PENN HOTEL, PITTSBURGH, PENNSYLVANIA

Mark the dates and place on your calendar today — and make your plans to attend. An exceptionally fine program has been set up that will give you two days of profitable, interesting and entertaining activities. Try to be there.

The Program Committee

Chairman, Tom M. Girdler, Jr., Superintendent, Union Drawn Steel Div.,Republic Steel Corp. Asst. Chairman: C. R. Harmon, Carbide Sales Manager, Firth Sterling Steel and Carbide Corp. Committee Members: C. W. Garrett, Metallurgist, Aliquippa Works, Jones and Laughlin Steel Co.; Charles Williams, Wire Mill Supt., Pittsburgh Steel Company, Monessen; George Fescon, Die Room Supervisor, Pittsburgh Steel Company, Monessen; and W. E. Hill, Jr., Plant Superintendent, Russell Birdsall and Ward Bolt and Nut Co., Rock Falls, Ill, who will serve as chairman of the Technical Session.

The Program

Thursday, May 8th, 8 A.M.: Registration desk open 8 A.M. to 6 P.M., 17th floor.

10 A.M.: Meeting of the Board of Directors in Parlor G, 17th floor.

12 Noon: Board of Directors Luncheon in Allegheny Room, same floor.

1:30 P.M.: Busses leave the Hotel for a tour of the plant of the Firth-Sterling Steel and Carbide Corp. Ladies are invited to go on this trip. *Admittance to the plant granted only to those wearing badges and arriving on the chartered busses.* Please do not try to go to McKeesport in private car — you cannot be admitted.

6-7 P.M.: Cocktail party in the Pittsburgher Room through the joint courtesy of R. H. Miller and Standard Industrial Compounds Companies.

7:00 P.M.: Banquet in the Pittsburgher Room. The speaker will be Thomas Patton, Vice President and Chief Counsel of the Republic Steel Corporation. Ladies are invited to the banquet.

Friday, May 9th, 9 A.M.: Technical session in the Monangahela Room, 17th floor.

PAPER: Drawing of Aluminum Wire, by Joseph Urbinik, Plant Supt., Kaiser Aluminum Co., Newark, Ohio. Covers both standard and fine sizes.

PAPER: The History and Development of Planetary and Thread Rolling Machinery, by George Paff, D. H. Prutton Machinery Co., Cleveland, Ohio.

SYMPOSIUM: Mechanical Cleaning of Rods and Wire. William Baldridge of Laclede Steel Company will serve as moderator, with discussion panel members as follows: Floyd Hauger, Standard Industrial Compounds Co., E. T. Miller, Firth Sterling Steel and Carbide Corp., and W. H. Hill, Northwestern Steel and Wire Co.

11:15 A.M.: Busses will leave the Hotel to visit the Monessen wire mill of the Pittsburgh Steel Co. Charles Williams of the company is in charge of the tour. Luncheon will be served to the visitors upon arrival through the courtesy of the Pittsburgh Steel Company.

TICKETS: A registration fee of $6.00 will be charged, that will cover tickets for the two plant visits. Tickets for the banquet will cost $6.00 and may be secured at the registration desk. Get your tickets immediately upon arrival.

Members may bring guests. We shall hope to see you there.

THE WIRE ASSOCIATION

Richard E. Brown, Executive Secretary

453 MAIN STREET **STAMFORD, CONN.**

New Type Cutter Developed for Rods, Wire and Rope

by Evans Jasper
Vice President and General Manager
Manco Manufacturing Company
Bradley, Illinois

This story of the development of a product to meet a need is typically American. A problem, a recognized opportunity, trying years of research, designing, building, testing, rejection—until a workable implement finally was successfully evolved. The Guillotine cutter was called to our attention by a user who suggested that we run an article on it. The author very kindly obliged and it is printed in this issue for the benefit of those who may not yet have heard of the new tool.

An important contribution to more efficient wire and rod mill operations has been recognized in a new line of portable hydraulic cutters recently developed. Aptly named "GUILLOTINE", the equipment comes in a variety of models to cut up through one inch high-carbon steel rod, as may be required for finishing operations, quality control and general purpose uses.

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Since the first units were introduced to industry less than two years ago, Guillotines have been placed in operation throughout the United States, Canada, South Africa, India, France, Switzerland, Norway, Sweden, Venezuela, and England.

★ ★ ★

The unusual success experienced in the use of this type of cutting equipment, which makes use of high pressure hydraulics, attracted the attention of Dr. Vannevar Bush, wartime head of the Office of Scientific Research and Development, who is collaborating with the manufacturer in his efforts to broaden the scope of the applications of the equipment.

★ ★ ★

An efficient model, the 20-E, operated by electric hydraulic pump connected to the compact cutting head with its unique manual valve control, is proving most useful for rod mill operations. Cutoff time for one inch steel rod is 2½ seconds.

★ ★ ★

The 20-E unit was developed primarily for cutting coiled hot-rolled rod. Hand tools for cutting small diameters have been in use for many years. But in coiled sizes, rods from ⅜ to 1-1/16 inches in diameter, problems arise in cutting samples for the laboratory and in removing the cobbled end of the coil.

★ ★ ★

The equipment available for this service up to the present time has been both bulky and ungainly. The large cumbersome alligator shears used on some installations necessitate the moving of coils to the shear to be trimmed and sampled. This method involves excessive handling and is too slow for modern rod mill production. Acetylene cutting torches are undesirable because it is difficult to make a clean cut, particularly if the coil is on a moving conveyor. Also the spatter from the burning and the air-hardening of some types of rod means difficulty on subsequent drawing operations. Portable abrasive cutoff wheels are slow and maintenance on them is high.

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A number of compressed air shears have been designed, but they too have been bulky and difficult to handle. Mechanical and air-powered shears built for other purposes have been adapted, but they often do not have sufficient pressure to perform the shearing operation, or the con-

Fig. 1—A cutter with 1" steel rod capacity using high pressure hydraulic pump and remote control valve.

trolling valves are so complicated that they have proven difficult to maintain in satisfactory working condition.

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Many of the cutoff devices now in use cannot be manipulated to cut off an 8 inch laboratory sample, so that it frequently is necessary wastefully to cut off an entire loop from which the samples later are cut.

★ ★ ★

The problem of building a shear especially suitable for the high-speed, large-production mills was brought to the author's company by the rod mill superintendent of a large Midwestern steel mill. In this mill, steel rod in coils is moved by conveyor to the loading docks after leaving the hot mill. They wanted a portable tool that could be operated by one man, that would cut test samples up to 1 inch, and that would require a minimum of maintenance.

Need Strength and Mobility

These specifications necessitated the building of a shear that would have the strength of an alligator shear and the flexibility and mobility of the average common bolt cutter. Repair and maintenance costs would have to be kept at a minimum, not so much because of actual expense, but because outages have such an adverse effect upon efficient handling of the production of the mill.

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This request resulted in the development of the cutter under discussion. Its hydraulic equipment develops 10,000 lbs. of pressure and is semi-portable, with power being supplied by 2 H. P. electric motor. The special cutting unit, weighing only 38 lbs., is connected to the pump by a 25-foot hydraulic hose.

★ ★ ★

With the pump operating, the operator closes the remote valve by hand pressure, causing the cutter blade to make the cut. Release of the hand valve provides automatic blade retraction. Standby cutting heads can be coupled quickly in place when overhaul or blade sharpening is required.

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The cutting cycle requires only a momentary surge of pressure from the pump. The pump, therefore, is not continuously highly loaded; hence, maintenance is at a minimum. The head can be furnished with a swivel attachment so that the head can be turned to make left or right hand cuts or up and down cuts. Each cutting head is operated by its own hydraulic pump.

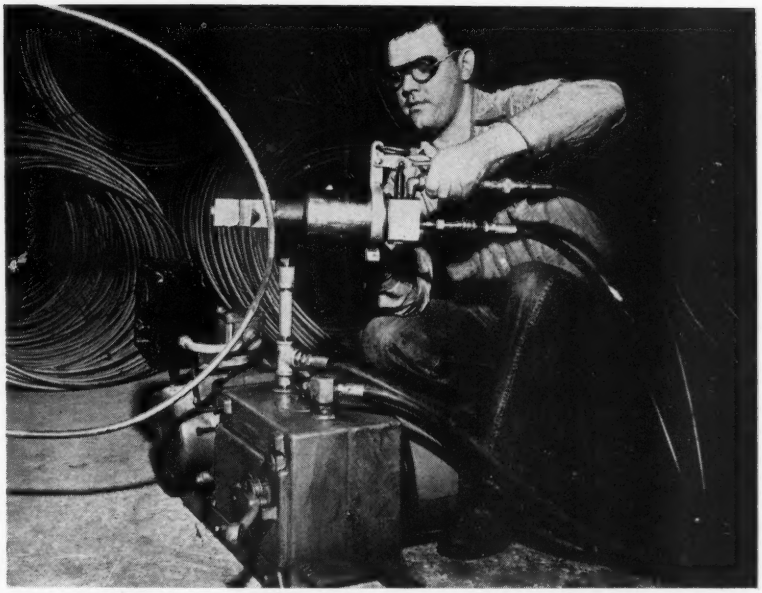

Fig. 2—Compact new Guillotine cutting unit affords 60,000 lb. thrust. Pump is semi portable. Head weighs only 38 lbs.

★ ★ ★

The shear unit in one large rod mill is suspended from a balancer attached to a monorail. One unit is attached to the front of the conveyor line and a second shearing head is mounted in the same manner on the back side of the conveyor line. Thus the shears are able to trim a cobbled end and cut a test sample from each coil of rod as it moves down the conveyor line, without interruption. Two shears can handle a maximum of 65 tons per hour, 24 hours per day, making possible a minimum of lost time and an exceptionally low repair and maintenance cost.

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The development of this cutter is the first attempt at applying high pressure hydraulics to rod shearing applications and enables the maintenance of full production in the most modern rod mills in operation today.

★ ★ ★

Problems of oil leakage under 10,000 p.s.i. pressure, breakage of cutting blades under 60,000 lbs. of thrust and design of a tool capable of withstanding such stresses, despite the portable size, were among the problems overcome in designing this equipment.

★ ★ ★

In the engineering and building of this new cutter, it was found that a balanced, mechanical type of hand valve, satisfactory for 10,000 p.s.i. hydraulic operation, was not commercially obtainable through regular channels. Pressure of 2500 p.s.i. is generally considered high in industrial applications. It became necessary to design a special valve that would permit the operator to control the cutting operation at a distance remote from the pump.

★ ★ ★

Special analysis steels for use in springs, forgings and castings had to be used to permit of a compact design for the cutting unit. Considerable research into material fatigue and the oil seal design for effective operation under maximum and minimum pressures, was made over a 4-year period. A typical field of concentration was the problem of operating tolerances. Much vital information was learned about effective clearances under high pressure operation and this was utilized to minimize excessive wear.

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Although units have been developed for cutting 3½ inch power cable; 1¾ inch wire rope, shearing 4″ x ¼″ strip, punching and riveting, other models recently added that are of particular interest to the wire industry are the 200-E, the

(*Please turn to page* 309)

Electrical Developments in 1951

(G.E. Annual Report)

Excerpts from the January issue of the General Electric Review, in which the company has made its annual report on development of the preceding year in its many departments. What is presented here are just those items that may be of interest to our readers.

The keynote of research and engineering in General Electric in 1951 was mobilization for defense.

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The major emphasis in the year has been to effect every possible saving in materials and construction and to substitute less critical materials for critical. This is engineering at its best. And the examples of the accomplishments recorded include practically every line; the emphasis has been universally applied.

Redesign Helps Save Materials

In large generators, core loss has been reduced by almost one-third without redesign, while size and weight have been proportionately reduced with redesign, by using grain-oriented steel, a product of much intensive research from previous years. Redesign of 23,529-kva hydrogen-cooled and 15,625-kva air-cooled generators has produced lighter and smaller machines. And it has been demonstrated that the more extensive application and use of automatic generator-voltage regulators results in economies both in generator construction and in system operation.

★ ★ ★

In three-phase distribution transformers, through design application, weight reduction of 20 to 35 percent has been accomplished; by using Class B insulation, sealed dry-type transformers have introduced economies in operation, and air-cooled specialty transformers have been reduced approximately 25 percent in size and weight, with consequent saving of copper.

★ ★ ★

Medium-size turbine-driven generators for ships' service were redesigned to give weight reduction of 25 to 39 percent including coolers, accomplished by applying axial ventilation for the first time, and by fully utilizing the allowable Class B insulation temperature rise.

Use of Critical Materials Reduced

Substitutes for critical materials involving a major engineering effort to save copper, nickel, aluminum, and cobalt were particularly pertinent in appliances. Plastics and plastics-coated steel replaced brass; fiber-glass-reinforced plastics replaced aluminum; cast iron replaced die-castings; in one valve nylon replaced brass. The magnetic latch for refrigerator doors was discontinued to conserve cobalt in the alnico magnets. By reducing the diameter of the heating unit in the G-E hand iron, an annual saving of 200,000 pounds of aluminum was accomplished, together with a saving of 46,000 pounds of magnesium oxide.

Development Expanded

Prominent in the province of the engineer is the ever-enlarging horizon of development, bringing products into being for the first time. Color television had its development upsurge in 1951; also, the exploration of the ultrahigh-frequency spectrum for television channels opened up an entirely new approach to television transmitter and antenna design. And many new electronic tubes of special types and of quality improvement were developed to meet the exacting requirements imposed by military necessity.

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Continual research work with phosphors is in progress to bring better television tubes. Electroluminescence is nearing the stage where practical applications will be forthcoming. Electron beams in air permit the advance of radiation knowledge; and the use of high-velocity electrons in destroying micro-organisms is being continued with a view to eventually applying this radiation process to the sterilization of food and drugs.

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Continued research work in metals is bringing new ferrites for advances in magnetic designs, and the application of the diffusion principle to metals testing has resulted in a new stress formula to decrease test time and greatly increase test output.

Winding-insulation Tester

The latest in a series of winding-insulation testers was developed in 1951. This newest surge-voltage tester is similar to earlier testers, but was specially designed to test very low impedance loads, such as d-c traction-motor armatures. With a maximum surge voltage of 7500 volts, the tester can also be used to surge-test series field coils and a-c stator coils up to the size used in 10,000-kva turbine-generators.

Cable

In all ranges of pressure and voltage gas-filled cable gained in popularity during 1951. The Pacific Gas & Electric Co. in San Francisco installed a large quantity of 120 kv 200 psi pipe cable, using a medium-viscosity impregnant. Medium-pressure gas-filled cable operating at 40 to 50 psi pressure was installed by the Potomac Electric Power Co. in Washington, D. C.

★ ★ ★

Large installations of low-pressure 15-kv cable were made by the Cincinnati Gas & Electric Co. and the Indianapolis Power & Light Co. In a 15-kv installation made by the Public Service Electric & Gas Co. of New Jersey, the gas pressure is also used to give pressure supervision of the subway-type network transformer tanks by means of gas

connections from the cable to the transformer tank. This feature avoids transformer failures due to entrance of moisture through any leaks that might develop.

★ ★ ★

Accelerated life tests on gas-filled cable in a vertical position showed that after drainage of surplus compound a stable condition was reached with plenty of compound left in the insulation for impregnating purposes. Also, there was no change in ionization voltage. This contradicts a former belief that such conditions would eventually leave the insulation dry, enlarging voids, and materially lowering the ionization voltage.

★ ★ ★

These laboratory findings were confirmed by examination of lengths of a 69-kv gas-filled cable that were removed after service on the Philadelphia Electric Company's system.

★ ★ ★

For a recent 120-kv high-pressure gas-filled pipe-type cable installation, joints were supplied that eliminated considerable field cutting and welding. The new arrangement allows a free gas path past the semistop in the joint end case after the joint is completed, and also permits the gas path to be closed during construction.

★ ★ ★

During 1951, radar cable for outdoor portable equipment for the U. S. Air Force was developed to withstand temperatures ranging from —65 to +135 F.

★ ★ ★

Aluminum interlocked armor cable is now available in addition to the conventional types. To provide extra-fast installation, aluminum-alloy cable racks that look like ladders make it possible to support a number of cables without using individual hangers.

★ ★ ★

Corona-detecting equipment capable of testing full-reel lengths of cable was developed in 1951, and every foot of 15-kv cable manufactured was tested for corona level in addition to the standard industry tests. When an air void is present in a cable, it will ionize if the voltage stress across the void is sufficiently high. The small remitting impulse is visually reproduced on an oscilloscope.

The measurement of oil volume in a balanced-pressure reservoir, always a rather exacting operation, was made easier by a new indicator that determines the correct oil volume, can be used at any time, and does not change the reservoir setting in any way.

Motors

Two 65,000-hp synchronous motors—the world's largest—were installed last year in the pumping plant at Grand Coulee Dam. Each motor stands 25 feet high and weighs more than 330 tons. They are used in the Bureau of Reclamation's Columbia Basin Irrigation Project under a program designed to help irrigate a vast expanse of rich but dry land in the south-central part of Washington state. They drive two of the world's largest pumps, each supplying enough water to equal the daily needs of New York City. When operating under optimum conditions, each pump supplies more than a billion gallons of water a day (50 tons a second).

★ ★ ★

To hold breakaway torque to a minimum, the thrust bearings are designed for high-pressure oil lubrication during starting. To accomplish this, oil is forced between the bearing surfaces through a special inlet in each segment of the stationary plate.

★ ★ ★

Production was started on a new line of aircraft gear motors in ratings from 1 to 4 hp for use in electrohydraulic actuators. Precision-gear design and manufacture with new means for oil lubrication provides higher ratings in small sizes. Liberal use of steel inserts in the aluminum housing assures adequate strength at all highly stressed points, excellent gear and mounting alignment, and light weight.

★ ★ ★

A new low-cost 150-watt radio dynamotor is now in production for automotive service to provide 400 to 700 volts d-c for taxicab and police-cruiser transmitters.

★ ★ ★

A quieter more efficient synchronous motor was developed for recording instrument drives. The new design eliminates most of the special parts and such critical materials as ball bearings and chrome magnet steel; nearly all components are the same as those used in standard business-machine motors.

★ ★ ★

For defense applications, there's a new 110-volt 400-cycle hysteresis-type synchronous timing motor for use in a compact 1½-inch panel-instrument elapsed-time indicator, Type ET-1, designed primarily to fill a gap in the military needs for maintenance of auxiliary equipment. The gear reduction, contained within an axial space of about 1 inch, is 1,728,000,000 to 1.

★ ★ ★

Development of an alternating-current polyphase motor whose speed can be finely controlled makes it possible for the synthetic-fibre industry to gain the benefits of precise speed control without more expensive d-c drives and a-c to d-c conversion equipment. Developed for nylon extruding machines, the new motor is coupled to an alternating-current generator to provide adjustable frequencies which vary less than 0.1 percent within process requirements. The fine speed control was accomplished by adding ball-bearing spring-loaded brush holders and electronic control to the General Electric Type ACA adjustable-speed brush-shifting induction motor.

★ ★ ★

A line of round-frame synchronous compressor motors was developed in ratings from 75 to 250 hp for close coupling to a new line of self-contained air compressors. Because the motor is mounted on the frame of the compressor, no special motor foundation is required during installation.

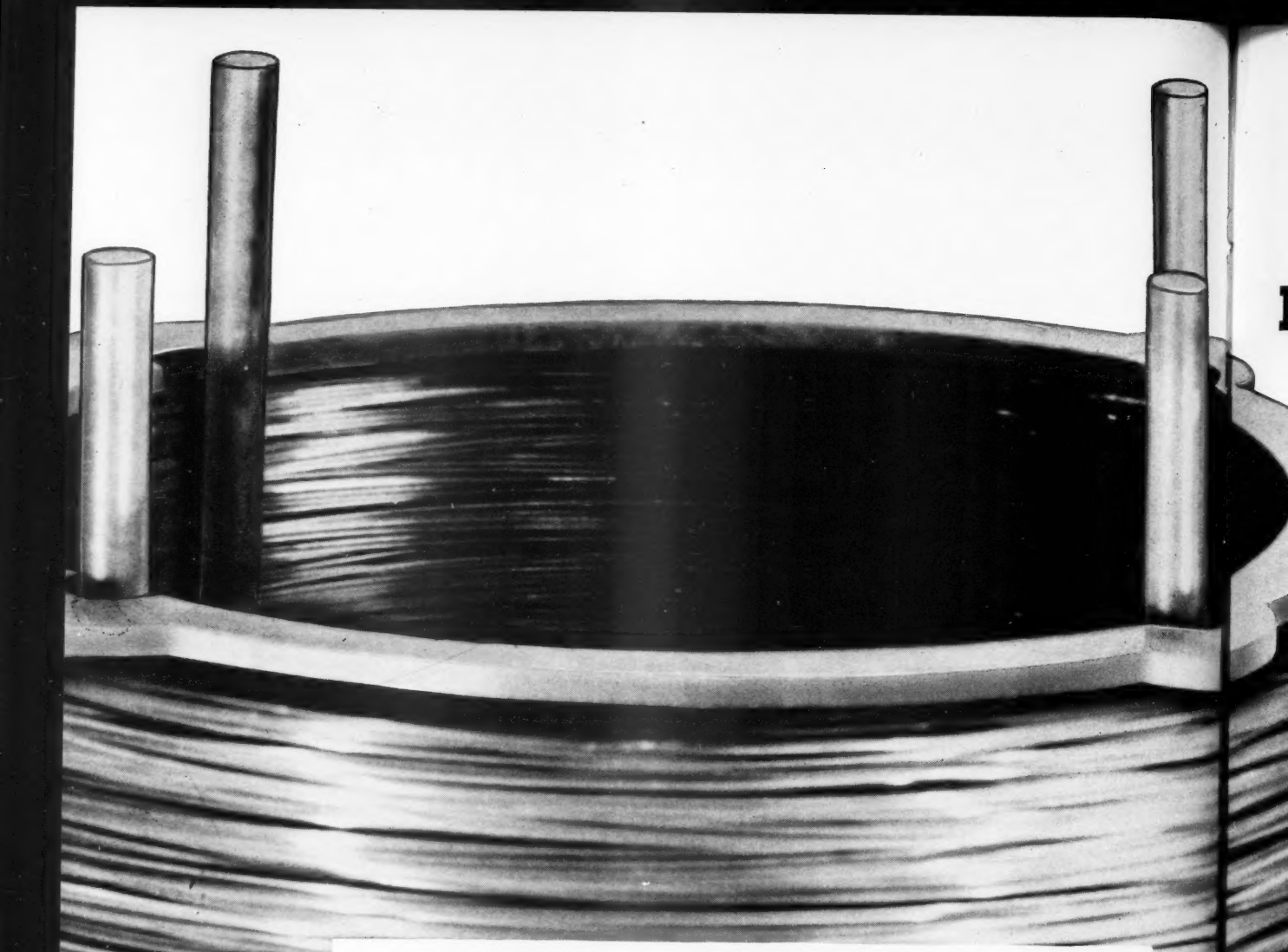
★ ★ ★

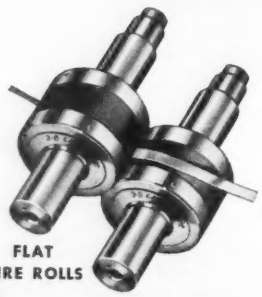
In locations where hazardous carbon black is present—the rubber and plastics industries—the trend has been to totally enclosed motors. During the year an 800-hp 2300-volt 720-rpm synchronous motor was built for the Goodyear Tire & Rubber Co. Designed with an air-to-water heat exchanger, the new motor eliminates cumbersome cooling ducts and the blower and motor required for forced-ventilated motors.

★ ★ ★

One of the most important improvements in magnet wire for

(*Please turn to page* 299)



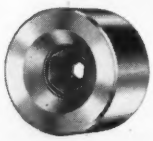


FLAT WIRE ROLLS

ROUND HOLE DIE

SQUARE DIE

SPECIAL SHAPE DIES



HEX DIE

Specify

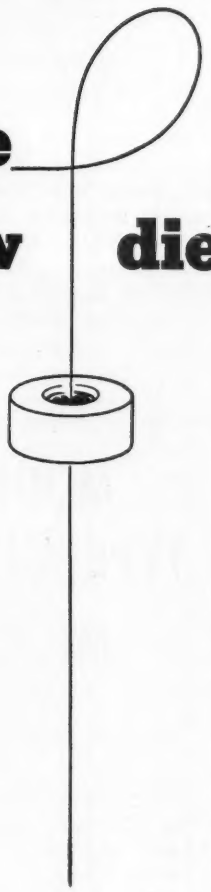
CARBOLOY

CEMENTED CARBIDE WIRE, BAR, AND TUBE DRAWING DIES

PRODUCTION RESUMED

As fast as Carboloy quality production methods permit, we are expanding present stocks of Carboloy Wire Drawing Dies in Die Centers in Detroit, Pittsburgh, Los Angeles, and Chicago. Check your needs; then write or call us. We will cooperate with you in every possible way in filling your needs.

How to get the *bonus* tonnage from your carbide draw dies



THERE'S BONUS tonnage in *Carboloy* Wire, Tube, and Bar Drawing Dies. We know. We make them of Carboloy Cemented Carbide, *hardest metal made by man.* We design and build every last one with tested extra stamina to give you extra drawing capacity and therefore new highs in die productivity. Then, to help you get from Carboloy Wire Dies everything we build into them, we offer the industry's most complete service program.

Free Carboloy Services

Die Service Centers. Turn baffling die service problems over to your nearest Carboloy Die Service Center, staffed and equipped to give you expert help whenever you need it.

Customer Training School. Train key men in our tuition-free school in 3- or 5-day courses packed with up-to-minute information and ideas that will pay off in saved dollars throughout your die handling operations. Specialists will work with your men on any die problems you may face in your plant.

Field Engineers. Call in your Carboloy Field Engineer as trouble shooter on die service and refinishing problems. He can focus the efforts of Carboloy Die Service Centers, our plants, our laboratories on any die problem you may have.

Technical Literature. Get free Carboloy Die Service Manual D-119. Forty-eight pages deal with die finishing techniques that will minimize downtime, cut die finishing time. Sixteen pages more discuss vital improvements in other phases of die handling.

"Carboloy" is the trademark for the products of
Carboloy Department of General Electric Company

CARBOLOY

DEPARTMENT OF GENERAL ELECTRIC COMPANY

11171 E. 8 Mile Road, Detroit 32, Michigan

Government Wire Production Information

January Bibliography of Technical Reports

The research and development activities of the National Bureau of Standards are discussed in the feature article of the current issue of the **Bibliography of Technical Reports** now available from the Office of Technical Services of the United States Department of Commerce.

Established fifty years ago, the National Bureau of Standards has served both industry and science as the principal laboratory of the Federal Government in the major scientific fields of physics, mathematics, chemistry and engineering. It has conducted basic research programs in the physical sciences to improve techniques of physical measurement and to get specific values for basic standards and physical constants as modern science needs them.

★ ★ ★

The Bureau has also embarked on projects involving pure and applied research and development to meet the needs of the Federal Government. For example the atomic bomb project was originally begun at NBS; a synthetic mica having essentially the same properties as natural mica has been developed; a program on high speed electronic computer is currently underway.

★ ★ ★

At present the Bureau has shifted its emphasis towards the development of projects to meet special needs of the Army, Navy and the Air Force.

★ ★ ★

Also included in the January issue of the **Bibliography** are reports on: Fire retardant paints; catalysts; measurements of the thermal conductivity of sodium and potassium; surface chemistry of silica; supersonic spot welding; processing of okra seed for oil recovery; soil compaction; heat pumps; effects of extreme heat on man; uses of contact lens in research; alloys for high-temperature service; thunderstorm electricity; and flame-proofing of fabrics.

★ ★ ★

In all, 234 reports are listed from federal, foreign and other non-confidential sources; most of them not previously publicized. A variety of technical fields are covered: Chemical and allied products; electrical machinery; fuels and lubricants; instruments; machinery; metals and metal products; physics; structural engineering; and transportation.

★ ★ ★

The January, 1952 issue of the **Bibliography of Technical Reports** sells for $.50 a copy, (yearly subscription rate $5.00 includes the Newsletter) and may be purchased from the **Office of Technical Services of the U. S. Department of Com-**

MODEL "J"
TYPE AUTOMATIC
MICRO-WELD BUTT WELDER

MICROMETER PRECISION — MICRO-WELD — TRADE MARK REGISTERED

This type welder is available in four Models (J-45-C) (J-5-C) (J-7-C) (J-8-C) for welding COPPER, ALUMINUM, and other nonferrous wire and rods, ranging in size from .080" to ½" diameter.

The welding cycle on these units is automatically completed by one single downward stroke of the foot pedal, which clamp the stack being welded, contact the welding switch, and supply the upset pressure on the weld.

All welders are equipped with annealing dies, filing vise, hand shears, and mounted on a 4-wheel truck.

MICRO PRODUCTS COMPANY
20 NORTH WACKER DRIVE, CHICAGO 6, ILL.
Telephone, State 2-7468

merce, Washington 25, D. C. or through the U. S. Department of Commerce field offices. Orders should be accompanied by check or money order payable to the Treasurer of the U. S.

Screw Thread Standards Supplement Now Available

The 1950 Supplement to Screw-Thread Standards for the Federal Services, 1944, contained in the 1950 supplement to National Bureau of Standards Handbook H28 (1944) is now available for purchase from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., at a cost of 50 cents.

★ ★ ★

Replacing and augmenting the 1949 Supplement to Handbook H24, this new supplement, prepared by direction of the Interdepartmental Screw-Thread Committee, makes effective a number of changes in American screw-thread standards adopted since publication of the 1944 edition of the handbook. Approval of these revised standards by the Secretaries of Defense and Commerce and the Secretaries of the Departments of the Army, Navy, and Air Force makes them available for application to new designs and for acceptance of bolts, screws, nuts, and other threaded products that conform to these standards.

★ ★ ★

This 1950 Supplement contains unified special threads and American National diameter-pitch combinations not yet recognized as unified standards but for which allowances and tolerances have been formulated in accordance with the principles of unified threads. Tables of tolerances, allowances, and other thread data for threads of special diameters, pitches, and lengths of engagement are also given.

Chrome Stainless Steel Removed From CMP Control

The National Production Authority has announced de-control of chrome stainless steel. Consumers no longer must obtain CMP-4B "tickets" to purchase the metal.

★ ★ ★

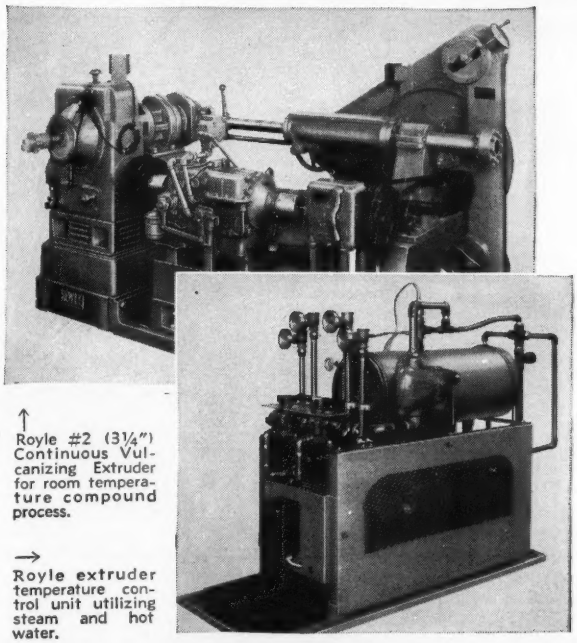
Production of non-nickel-bearing steel will continue under controls of

Of Particular Importance

To the Wire Insulating Industry

The room temperature compound process and associated equipment recently developed by the Western Electric Company, Incorporated, offer nine important advantages. These advantages begin with the storage of completely mixed, ready-to-extrude, rubber, GR-S, or Neoprene compounds and extend to a smoother and improved appearance for the finished product.

The complete extruder vulcanizing portion of the room temperature compound process is available to insulated wire producers* from John Royle and Sons who, for seventy-two years, have been building extruding machines to meet the most exacting process requirements.



↑ Royle #2 (3¼") Continuous Vulcanizing Extruder for room temperature compound process.

→ Royle extruder temperature control unit utilizing steam and hot water.

CHECK THESE ADVANTAGES:

- Improved diameter control
- Reduction in compound scrap
- Reduction in electrical faults
- Permits storage of completely mixed compounds
- Permits more economical scheduling of mixing equipment
- Eliminates "warm-up" operation
- Possible mill-room economies
- "Hot" machines may be converted
- Finished product has smoother finish—better appearance

**Licensees of Western Electric Company*

JOHN ROYLE & SONS
10 ESSEX STREET, PATERSON 3, NEW JERSEY

AMERICAN CHEMICAL PAINT COMPANY
AMBLER CHEMICALS ACP PROCESSES PENNA.

Technical Service Data Sheet
Subject: CHARACTERISTICS OF AND USES FOR RODINE®

A. SULFURIC ACID PICKLING

TYPE OF RODINE	POWDERED	POWDERED	POWDERED	LIQUID	LIQUID	LIQUID	LIQUID
FOAMING OR NON-FOAMING	FOAMING	NON-FOAMING	NON-FOAMING	FOAMING	NON-FOAMING	NON-FOAMING	NON-FOAMING
WITH WHAT ACID USED	SULPHURIC ONLY	SULPHURIC ONLY	SULPHURIC ONLY	SULPHURIC OR MURIATIC MIXTURES CONTAINING WEAK NITRIC	SULPHURIC MURIATIC	SULPHURIC PHOSPHORIC HYDROFLUORIC	SULPHURIC ONLY
WITH WHAT STRENGTH ACID	ANY PICKLING STRENGTH	ANY PICKLING STRENGTH	ANY PICKLING STRENGTH	ANY PICKLING STRENGTH	ANY PICKLING STRENGTH	ANY PICKLING STRENGTH	ANY PICKLING STRENGTH
TEMPERATURE LIMITATIONS	ANY PICKLING TEMPERATURE	ANY PICKLING TEMPERATURE	ANY PICKLING TEMPERATURE GOOD IN HOT ACID	PREFERABLY NOT OVER 180° F	ANY PICKLING TEMPERATURE GOOD IN HOT ACID	ANY PICKLING TEMPERATURE FAIR IN HOT ACID	ANY PICKLING TEMPERATURE GOOD IN HOT ACID
SOLUBILITY	PARTLY SOLUBLE READILY DISPERSED	PARTLY SOLUBLE READILY DISPERSED	PARTLY SOLUBLE READILY DISPERSED	SOLUBLE	ACCUM. READILY DISPERSED IN HOT ACID BATH	SOLUBLE	MEDIUM READILY DISPERSED IN HOT ACID
BEST SUITED TO TYPE OF STEEL	UNREACTIVE STEELS-O.H. STEELS-SHEETS-TIN PLATE.	UNREACTIVE STEELS O.H. STEELS-SHEETS TIN PLATE	REACTIVE OR UNREACTIVE STEELS O.H. OR BESSEMER SIMPLE OR ALLOY LOW OR HIGH CARBON	UNREACTIVE STEELS O.H STEELS STAINLESS STEELS	REACTIVE STEELS ALLOY AND PLAIN ALSO O.H. AND UNREACTIVE STEELS	ANY TYPE STEEL	REACTIVE STEELS ALLOY AND PLAIN ALSO O.H. AND UNREACTIVE STEELS
OUTSTANDING USES	FAST PICKLING. TIN PLATE WHITE PICKLER.	FAST PICKLING. TIN PLATE WHITE PICKLER	FAST OR SLOW PICKLING TUBE AND PIPE ALLOY STEELS	FAST PICKLING STAINLESS STEELS IN BATH CONTAINING WEAK NITRIC ACID	USED WITH SALT IN SULPHURIC PICKLE. CAN BE ADDED TO CONCENTRATED ACID	PICKLING FOR PLATING OR WHERE A SOLUBLE INHIBITOR IS INDICATED	USED WITH SALT IN SULPHURIC
USUAL PROPORTION FOR PICKLING	20% TO 50% B.V. OF SULPHURIC ACID	20% TO 50% B.V. OF SULPHURIC ACID	20% TO 50% B.V. OF SULPHURIC ACID	1-2 TO 1% B.V. OF SULPHURIC ACID	1/4 TO 1% B.V. OF SULPHURIC ACID	1/4 TO 1% B.V. OF SULPHURIC ACID	1/4 TO 1% B.V. OF SULPHURIC ACID
MISCELLANEOUS COMMENTS	WHEN ADDED CONTINUOUSLY MIX IN A THIN SLURRY OF DILUTE SULPHURIC ACID	WHEN ADDED CONTINUOUSLY MIX IN A THIN SLURRY OF DILUTE SULPHURIC ACID	ADD IN A SLURRY OF WATER OR ADD DIRECT TO BATH AFTER IT REACHES PICKLING TEMPERATURE	FORMS A HEAVY FOAM BLANKET	ADD DIRECT TO BATH AFTER IT REACHES PICKLING TEMPERATURE	CAN BE ADDED TO WARM OR COOL PICKLE BATHS	ADD TO BATH AFTER IT REACHES PICKLING TEMPERATURE
EFFECTIVENESS COMPARED WITH OTHER RODINES	MEDIUM	MEDIUM	STRONG	MEDIUM	STRONG	MEDIUM	STRONG

B. MURIATIC ACID PICKLING

TYPE OF RODINE	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID
FOAMING OR NON-FOAMING	FOAMING	NON-FOAMING TO SEMI-FOAMING	NON-FOAMING	NON-FOAMING TO SEMI-FOAMING	NON-FOAMING
WITH WHAT ACID USED	MURIATIC AND SULPHURIC. MIXTURES CONTAINING WEAK NITRIC	MURIATIC	MURIATIC	MURIATIC	MURIATIC
WITH WHAT STRENGTH ACID	ANY PICKLING STRENGTH	ANY PICKLING STRENGTH	ANY PICKLING STRENGTH	30% TO UNDILUTED	30% TO UNDILUTED
TEMPERATURE LIMITATIONS	ANY PICKLING TEMPERATURE	COLD OR HOT GOOD IN HOT BATHS	LESS THAN 150° FAHR	FROM 100° FAHR UP	LESS THAN 120° FAHR
SOLUBILITY	FAIR	GOOD	GOOD	GOOD	GOOD
BEST SUITED TO TYPE OF STEEL	ANY	ANY	ANY	ANY	ANY
OUTSTANDING USES	WHERE A FOAM IS REQUIRED ON MURIATIC ACID BATHS	PICKLING. REMOVING LIME SCALE FROM EQUIPMENT IN WEAK MURIATIC SOLUTION	PICKLING IN WARM WEAK MURIATIC ACID PICKLING FOR PLATING	CLEANING OIL WELLS OR EQUIPMENT IN STRONG HEATED SOLUTIONS	CLEANING IN COOL STRONG MURIATIC SOLUTIONS
USUAL PROPORTION FOR PICKLING	1/8 TO 1/2% B.V. COMMERCIAL MURIATIC ACID	1/8 TO 1/2% FOR PICKLING. 2 TO 3% FOR CLEANING EQUIPMENT	1/8 TO 1/2% FOR PICKLING	1/8 TO 2% B.V. COMMERCIAL MURIATIC ACID	2 TO 3% B.V. COMMERCIAL MURIATIC ACID
MISCELLANEOUS COMMENTS	OTHER GRADES BETTER FOR CLEANING EQUIPMENT	CAN BE ADDED TO UNDILUTED MURIATIC ACID TO BE DILUTED	CAN BE ADDED TO UNDILUTED MURIATIC ACID TO BE DILUTED	WILL PLATE COPPER ON WORK IF USED IN WEAKER MURIATIC SOLUTIONS	WILL PLATE COPPER ON WORK IF USED IN WEAKER MURIATIC SOLUTIONS
EFFECTIVENESS COMPARED WITH OTHER RODINES	MEDIUM	MEDIUM	MEDIUM	STRONG	STRONG

C. SPECIAL APPLICATIONS

"Rodine" is effective in pickling iron-nickel alloys and alloys containing both nickel and cobalt, in muriatic acid, or in sulfuric acid containing 1% to 2% of muriatic acid. It is also used in the pickling of white metals, alloys of copper, nickel, etc. Special grades of "Rodine" are available for the spray pickling of magnesium sheets in sulfuric acid.

CHEMICALS ACP PROCESSES

WRITE FOR DESCRIPTIVE FOLDER ON "RODINE" AND INFORMATION ON YOUR OWN PICKLING PROBLEM.

CHEMICALS ACP PROCESSES

the metal schedule Order M-80, by which mill production of all alloy steel is regulated, and under basic steel Order M-1, which regulates steel production by directors. The 45-day inventory limitation also remains in effect.

★ ★ ★

This move changes non-nickel-bearing stainless steel from a controlled material under CMP regulation to a non-controlled material. Consumers thus may purchase the metal from warehouses, mills or any other suppliers without first obtaining CMP-4B tickets from NPA. The direction also makes it subject to DO rated orders.

Reviews Silver Market for 1951

Handy & Harman, fabricators of precious metals, have issued their 37th Annual Review of The Silver Market covering 1951.

★ ★ ★

In spite of a very sharp dropping off in demand for sterling by the silverware manufacturers, approximately 110,000,000 ounces of silver were consumed in the arts and industries in the United States, a drop of only 10,000,000 ounces, the report says.

★ ★ ★

The development in the Handy & Harman laboratories of low temperature brazing alloys and silver solders has brought about wide-scale use of silver in industry in recent years. Starting primarily with the refrigeration industry, the silver brazing alloys are now playing a big part in the making of many products, including defense equipment.

★ ★ ★

The use of silver brazing alloys in industry has increased production in assembling parts with strong, leak-tight, ductile joints. The low flowing temperature and fast brazing action have caused manufacturing companies to turn to the alloys as a means of producing brazed parts in volume.

★ ★ ★

The Review also points out that there is no apparent reason to fear that adequate supplies will not be available in the coming months, even if defense spending is stepped-up and the use of silver is substituted for scarce metals.

★ ★ ★

Scrap Vitally Needed

There's urgent need to increase the flow of scrap metal from all possible sources. Immediate results can be obtained by reaching beyond the metal-working plants and persuading the less obvious sources to cooperate in the recovery effort. Scrap metal can come from any factory using machinery, from any firm making metal products, from farms and from many companies which may believe they have none. For instance: A shirtmaker finds 98 tons around his main plant; a small button works scraps 20 tons of obsolete machinery; a metropolitan bus line rounds up 200 tons in its shop; a paper company intensifies its annual scrap drive and collects 125% more tonnage than in the previous year; a dairy uncovers about 150 tons of scrap.

★ ★ ★

In short, wherever there is business there is scrap. That scrap may be "production scrap" or "dormant scrap." It's the dormant scrap, which does not flow to mills normally, that's so badly needed today. Dormant scrap is found wherever obsolescence, wear, accident, damage or other cause has brought retirement from active service of products containing steel, iron, copper, brass, bronze, aluminum, lead and zinc. Examples are: abandoned bridges, streetcar rails, etc.; locomotives, freight cars out of service; farm equipment beyond repair; condemned ships; obsolete machinery, tools, jigs, dies, fixtures and other equipment in industry, including items broken, worn beyond repair, abandoned, dismantled or in need of replacement parts no longer obtainable.

★ ★ ★

Production scrap—the scrap that accumulates in plants working with metals—usually takes the form of turnings, borings, clippings, punchings, chips, trimmings, plate ends, etc. This normally flows from industrial plants to scrap dealers as quickly as it accumulates. Only if it is being thrown on the dump do we need concern ourselves with its disposition.

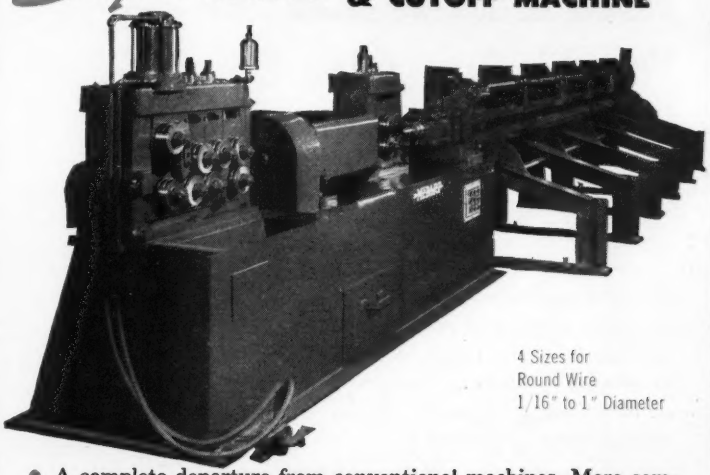
★ ★ ★

The main job is to get the dormant scrap out. And the following basic instructions, if followed by **every** business, can assure success of the expanded recovery program:

A New & Different Fully Automatic Wire Straightener!

MEDART

Supermatic WIRE STRAIGHTENING & CUTOFF MACHINE



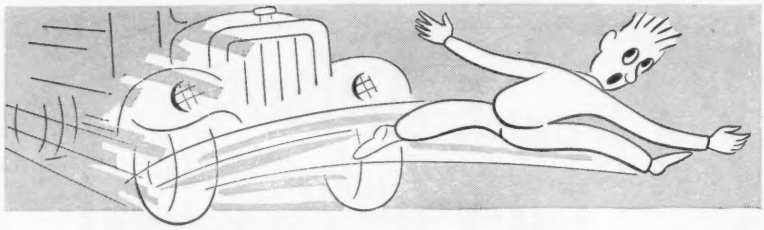
4 Sizes for Round Wire 1/16" to 1" Diameter

- A complete departure from conventional machines. More compact and accurate, with throughput speeds to 200 f.p.m. depending upon size and type of material.
- Fully automatic feed-through, straightening and cutoff, without attention from operator, after end of coil is started through pinch rolls.
- All swelling or expansion of workpiece is prevented by new HYDRA-ELECTRIC AUTOMATIC CUTOFF. Electronic self-actuating shear eliminates all mechanical operating parts beyond Cutoff. Makes up to 60 cuts per minute.
- Exclusive ROTO-DIE SPINNER is equipped with cylindrical straightening dies mounted in anti-friction bearing, instead of ordinary cast iron shoe-type dies. Virtually all friction, heat and rapid die wear are prevented. Protects against changes in physical characteristics and surface of wire.
- Automatic scale removal from hot-rolled stock.
- Rugged construction. Timken bearings throughout. Ground and polished Smavroc steel rolls. All mechanism completely accessible for maintenance.

Supermatic fully automatic two-plane models for wire shapes other than round also available.

Write For Brochure

THE MEDART COMPANY 3535 DE KALB STREET ST. LOUIS 18, MISSOURI



For the *spring* of your *life*

see the man with a

Versatile Torrington Spring Coiler

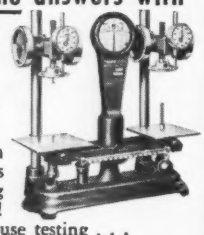
In spring coiling, the words "Torrington" and "Versatile" are synonymous! When you desire springs produced to meet exacting requirements, just call the professional springmaker who has a Torrington coiler. He's the man who can fill your needs with accuracy, speed and economy. On special springs, our sales department will gladly assist you in finding a source of supply, or help your springmaker devise just the right tooling to produce it.

Torrington's 14 different Spring Coilers cover a range of wire diameters from .003" to .750"

MODEL W-11 SPRING COILER

Wire diam. range: .015" to .072". Length per spring: 0" to 42". O. D. Coil Range: 3/32" to 1 9/16". Produces 23 to 190 springs per minute with variable speed drive. Extra wire feed gears, torsion, other attachments available.

NOW... Spring Makers and Users can get the same answers with The TORRINGTON SPRING TESTER



An accurate, uniform and inexpensive means of measuring spring load and deflection! For inspection or in-use testing . . . to aid in designing and developing springs for specific uses or as a basis for statistical quality control. Write today for illustrated bulletin on the Torrington Spring Tester!

The TORRINGTON MANUFACTURING COMPANY TORRINGTON, CONNECTICUT

1. Start an emergency inspection and inventory of all heavy steel, whether machines, equipment, beams or plates. Dispose of everything you possibly can to a scrap dealer.

2. The top executive of every industrial and commercial establishment, large and small, should appoint someone with authority to act in cleaning out dormant scrap.

3. In large industrial firms the chief executive should insure complete coverage by appointing a salvage committee with authority to determine what is scrap and to order its disposal. The committee should:

   a. Search all plants and properties, regardless of size, for dormant scrap;
   b. Survey potential wrecking and dismantling projects that will produce scrap;
   c. Make disposition of all production and dormant scrap as quickly as possible.

4. Put scrap collection on a "housekeeping" basis—Make it the personal responsibility of the committee chairman to initiate a program to clean out the dormant scrap and to make a scrap survey every 30 days. Besides increasing the supply of scrap, continuous scrap recovery from questionable old standbys, obsolete machines and equipment reduces taxes through inventory write-off, improves safety conditions, gives lowered insurance rates and clears valuable space.

★ ★ ★

Where there is business there is scrap. Will you do you part—in your own mill and by asking your customers to do theirs?

Carboloy Distributor Expands Service

Ellfeldt Machinery & Supply, Kansas City, has announced a major expansion of its service to industry in the state of Kansas.

★ ★ ★

Since 1945, Ellfeldt has been supplying Carboloy standard tools to industrial plants in the Kansas City area. It is now also in a position to supply the same tools—which permit speeding up of production, cut costs and permit machining of metals practically impossible to machine otherwise—to industrial plants throughout the state.

★ ★ ★

Phelps Dodge Making New Type Coaxial Cable

Whipple Jacobs, president of **Phelps Dodge Copper Products Corporation,** announced shortly after the turn of the year that his company had begun to market a new type of coaxial cable that would employ aluminum as the outer conductor and sheath.

★ ★ ★

For microwave uses, this cable is built with a central conductor held in the exact center of the outer sheath and conductor by a spiral of interior insulation tape which occupies about 12 percent of the space —the rest being air dielectric.

★ ★ ★

The cable uses Styroflex (a flexible form of polystyrene) as interior insulation and offers tremendous advantages for television and other microwave uses. The invention of Heinz Horn of Cologne, the cable is already in use in more than 150 installations in Europe. Mr. Horn manufactured and installed the American coaxial cable from Key West to Havana for telephone use in 1931, believed to be the first American installation of this type of communications cable. This Key West installation used paragutta insulation, a Bell Telephone Laboratory invention.

★ ★ ★

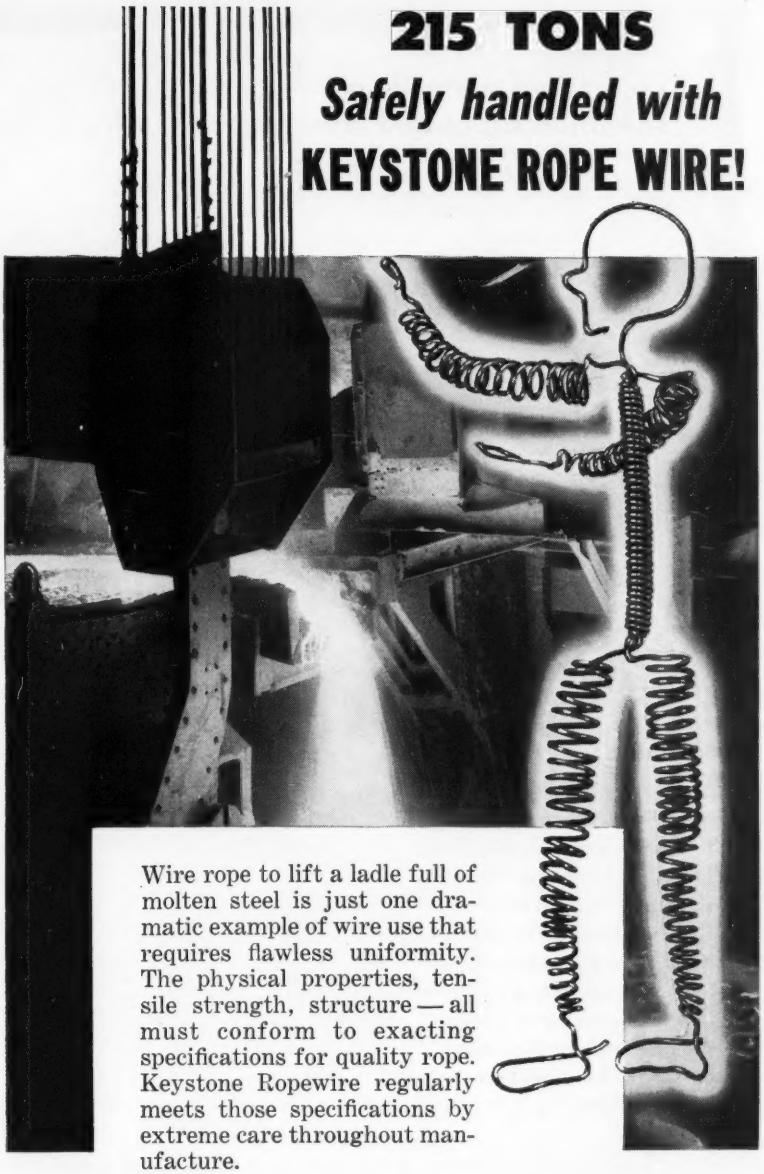
This cable will be generally cheaper than cable previously available for microwave use and considerably more efficient. It employs a continuous insulation in the form of a helix, that maintains the spacing of the inner and outer conductors. The helix is built up of hundreds of extremely thin Styroflex tapes wound on with great precision by a taping machine. The technique of insulating with tape has many advantages:

1. **the size of the inner or outer conductor can be changed with little trouble;**
2. **many new materials may be used which are available in the form of tapes; and**
3. **the inner conductor is maintained absolutely centralized even at sharp bends within the thickness of one tape, namely 2 to 4 thousandths of an inch, a feature of great importance at 2000 megacycles."**

★ ★ ★

The cable is said to be without reflections which cause ghost images

215 TONS
Safely handled with
KEYSTONE ROPE WIRE!



Wire rope to lift a ladle full of molten steel is just one dramatic example of wire use that requires flawless uniformity. The physical properties, tensile strength, structure — all must conform to exacting specifications for quality rope. Keystone Ropewire regularly meets those specifications by extreme care throughout manufacture.

INDUSTRIAL WIRE SPECIALISTS

The regular uniformity of all Keystone industrial wire is attained by careful selection of specially prepared steel, slow and meticulous processing and rigid inspections.

The same care and attention will be given to the wire you require for your product regardless of type and quality.

For your industrial wire problems consult with Keystone's Industrial Wire Specialist.

More SCRAP today... More STEEL tomorrow!

Keystone Steel & Wire Company
PEORIA, ILLINOIS

Cover non-metallic sheathed cable and weatherproof wire

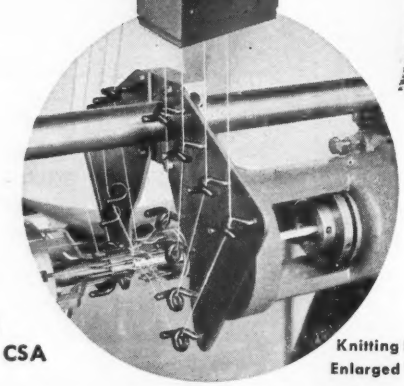
1800 feet an hour

with

***Fidelity* SINFRA KNITTERS**

Model C-3H Knitter & Haul-Off Reel Stand

- ★ Increase speed 10-15 times
- ★ Save on cost of yarn
- ★ Boost labor output 600%
- ★ Eliminate yarn rewinding
- ★ Conserve floor space
- ★ Cut maintenance costs
- ★ Reduce power requirements
- ★ Minimize operating noise
- ★ Improve working conditions
- ★ Provides automatic control
- ★ Lower your capital investment
- ★ Approved by UL, ASA, AAR, CSA



Knitting Head Enlarged View

This *Fidelity Sinfra* Wire Covering Machine offers you high production speed and low operating cost. The output of *one* Knitter equals 15 conventional machines. Savings in yarn costs and direct labor alone pay for this new equipment in 12 to 24 months. Knit products are universally used and meet all standards.

The modern Fidelity Sinfra method uses fewer yarns and large 3 pound cones located on a stationary creel. High-speed, rotating Knitting Heads cover the wire at 30 or more feet per minute. Design permits horizontal operation at convenient working level with no crawling or stretching. Automatic electric stop motions and other advanced features cut maintenance and down time.

To see why top companies choose Fidelity, read our literature proving its advantages. Write today for Catalog W.

Manufacturers of intricate precision machinery since 1911

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in television and distortion in communications.

★ ★ ★

The availability of aluminum sheathing for electric power and communications cables makes possible a high strength sheath and opens the field for many new and interesting designs. To power cable engineers it should be the most interesting development since the war.

★ ★ ★

Through an agreement with Felton & Guilleaume Carlswerk, of Cologne, Germany, their new aluminum sheath extrusion process will be made available with the prospect of savings up to 25 percent, based on current raw material prices. The German concern has been in production of aluminum cable sheathing in continuous lengths for several years up to diameters of three and a half inches. A new extrusion press will shortly be in operation that will extrude commercial aluminum sheathing up to 7 inches in diameter.

Carboloy Products to be Displayed at Tool Engineers Exposition

A comprehensive display of the products and services of the **Carboloy Department of General Electric Company,** Detroit, considered essential to any program of "tooling for security" will be exhibited at the **American Society of Tool Engineers'** Industrial Exposition in Chicago, March 17th to 21st, inclusive.

★ ★ ★

Of prime importance will be the latest in standard Carboloy single point tools and tool blanks, in view of their necessity to industry in its efforts to increase control of precision, achieve higher output and reduce costs in high production.

★ ★ ★

Carboloy Department's new Series 600 chrome carbide will be on exhibit in various forms of gages, etc. for which the metal has outstanding properties. Carbide bearings will be featured in view of their ability to stand higher speeds and loads than conventional bearing materials.

"Corrosion Testing"

The 1951 ASTM Edgar Marburg Lecture — CORROSION TESTING — by Francis L. LaQue, In Charge of Corrosion Engineering Section, Development and Research Division, The International Nickel Co., Inc., New York, has been published in the form of a 96-page profusely illustrated booklet.

★ ★ ★

This excellent and informative lecture comprises a survey of corrosion-testing programs and methods of corrosion testing, many of which have been sponsored by the American Society for Testing Materials. Mr. LaQue, one of the best known authorities on the practical aspects of corrosion phenomena discusses the distinction that must be made between the corrodibility of a material and the protective value of its corrosion products and how these are influenced by both the composition of the material and the incidental conditions of its exposure.

★ ★ ★

Some of the topics touched on in the book are as follows: atmospheric corrosion studies; relations between rust color and corrosion; effects of alloying elements on the resistance of steels and irons to atmospheric corrosion; comparison of atmospheres; and galvanic corrosion. Also discussed are a variety of tests such as: acid, accelerated, atmospheric galvanic, salt spray, laboratory total immersion and alternate immersion, boiling nitric acid, plant corrosion, paints, etc.; tests in waters; corrosion tests of insect screens; long-time tests of different steels and irons; and effects of position in test.

★ ★ ★

Copies of this 96-page booklet, heavy paper cover, can be procured from the **American Society for Testing Materials**, 1916 Race Street, Philadelphia 3, Pa., at $1.50 each.

★ ★ ★

Low Temperature Brazing Flux For Titanium

Handy & Harman announces the development of a special brazing flux for use in the joining of titanium and zirconium, and their alloys. Silver brazing alloys readily wet the titanium which is protected by the flux.

★ ★ ★

NARCO METAL BOUND REELS provide 300% more service. Exhaustive tests have shown a 24" all-wood reel will average four trips—*with repairs*. A NARCO METAL BOUND REEL of the same size will average 12 to 16 trips *with no repairs*. All for only approximately 50% more cost.

NARCO METAL BOUND REELS are made in 12" to 48" diameters. All-wood reels from 12" in diameter to any size required.

All reels shipped assembled or knocked down for assembly to wood or steel drums.

Further information or quotations promptly furnished.

North Anson Reel Co.

TELEPHONE MADISON 187-2 NORTH ANSON, MAINE

Outstanding Personalities of the Wire Industry

Wilder Elected Vice President by Macwhyte

At the regular quarterly meeting of the Board of Directors of **Macwhyte Company,** on January 29th, **George C. Wilder** was elected Vice President and Assistant General Manager of Macwhyte Company.

★ ★ ★

George C. Wilder has served as Assistant to the General Manager since January, 1949, and from 1946 to 1949 served as southern Wisconsin traveling representative for the company.

★ ★ ★

Prior to this, he served four years in Army Ordnance and was discharged as Captain. Before entering the Armed Services on March 17, 1941, he was employed by Macwhyte Company Sales Department in August of 1938. In June of 1938 he graduated and received a B.A. degree from Cornell University.

★ ★ ★

Other officials of Macwhyte Company are: **Jessel S. Whyte,** President and General Manager; **H. E. Sawyer,** Vice President and Treasurer; **R. B. Whyte,** Vice President in Charge of Operations; **R. P. Tyler,** Vice President in Charge of Sales.

★ ★ ★

Richard Piez to Represent Two Companies on West Coast

Richard Piez, formerly with **Dewey and Almy Chemical Co.,** is now the West Coast manufacturer's agent for the **New England Lacquer Company** and **Chemical Products Corporation,** both of East Providence, Rhode Island.

★ ★ ★

The New England Lacquer Company manufactures specialty cable coatings for insulated wire and polystyrene finishes, and Chemical Products Corporation produces vinyl plastisols for a wide variety of industrial uses.

★ ★ ★

Since Mr. Piez has spent 15 of his 20 years with Dewey and Almy on the West Coast, he is looking forward to renewing old friendships in the area.

★ ★ ★

His office address is 151 D West Hillsdale Blvd., San Mateo, California.

★ ★ ★

Aetna-Standard Appointment

The Aetna-Standard Engineering Company announces the appointment of **A. H. Stromeier** as Sales Engineer for the Tubular Division. Mr. Stromeier has served Aetna-Standard since 1936 as Mechanical Engineer and more recently as Designer, Proposal and Project Engineer. He is registered as a Mechanical and Professional Engineer in Ohio.

Glader—Years of Proven Performance
GLADER NAIL MACHINES
55 YEARS of experience meeting the exacting demands of nail making.
The machine with a record of steady dependable service.
Wm. GLADER MACHINE WORKS
210 N. RACINE AVENUE
CHICAGO 7, ILLINOIS
Export Dept.: 122 E. 42nd Street, New York 17, N. Y.

John C. Coppick Made General Manager

L. A. Forsyth, President of **Dominion Steel and Coal Corporation, Limited,** has announced the appointment of **John C. Coppick** as General Manager of Graham Nail and Wire Products, Limited, Toronto, and Canadian Steel Corporation, Limited, Ojibway, Ontario, Canada.

John C. Coppick, Gen'l Mgr., Graham Nail & Wire Products, Ltd., Toronto and Canadian Steel Corp., Ltd., Ojibway, Ont., Canada.

★ ★ ★

L. F. Boland Made Sales Manager of Beryllium Corporation

Lawrence J. Boland was appointed to manage the sales department of the **Beryllium Corporation,** Reading, Pa. He joined the firm in 1935 and has served in various capacities, including sales.

★ ★ ★

Matthew J. Donachie, who, as previously noted in these columns, is now acting president of the company, has been active in Beryllium's affairs as a consultant and an officer for the past 16 years and has been identified with its interests in research, development, expansion and production work.

★ ★ ★

Chase Brass Shifts Sales Personnel

Frederick K. Pulsifer, manager of the Pacific Coast Division of **Chase Brass & Copper Co.,** Waterbury, Conn., has replaced **Charles L. Moseley** as Rochester, N. Y., dstrict manager and Mr. Moseley has been transferred to the general sales offices of the company in Waterbury.

★ ★ ★

Fidelity Machine Company Appointments

Robert Scholes, who has been associated with the company for 13 years and who has been Works Manager, has been elected to the post of Vice President in Charge of Engineering.

★ ★ ★

Roy D. Faigenbaum, also with a record of 13 years of service with **Fidelity,** recently in the position of Plant Superintendent, was elected at the same time to the office of Vice President in Charge of Manufacturing.

★ ★ ★

Both appointments became effective as of January 1, 1952.

★ ★ ★

MEASURE FOOTAGE THE NEBUTTCO WAY

Nebuttco Wire Measuring Machines measure the footage of wire and cable, accurately, dependably. Built for heavy-duty, production service, these machines register the footage directly on an easy-to-read counter. Lengths up to 100,000 feet . . . nearly 19 miles . . . can be counted at one setting of the machine. Machines are supplied either with counter on right or left side, as needed, and are also available with electric predetermined counters.

Nebuttco Wire Measuring Machines are versatile, easily transferred from one job to another, easily adjusted to proper height for the job. Machine illustrated is made in two sizes — No. 1 for measuring wires to 5/8" diam. and No. 2 for wires to 1½". We also manufacture a small bench type machine for measuring any flexible material not over 5/16" diam.

For complete specifications ask for Circular No. 1

NEW ENGLAND BUTT COMPANY 1842
304 PEARL ST.,
PROVIDENCE 7, R. I., U. S. A.

JAMES DAY (MACHINERY) LTD., 28 MADDOX ST., LONDON, W-1, ENGLAND

Pennsalt Vice President Named Director of OPS Division

William P. Drake, Vice President of the **Pennsylvania Salt Manufacturing Co.,** Philadelphia, has been named Director of the Rubber, Chemicals and Drugs Division of the Office of Price Stabilization.

★ ★ ★

The new director succeeds **Thomas H. McCormack,** who is returning to his duties as Director of Sales of the Grasselli Chemicals Division, E. I. duPont de Nemours & Co., Wilmington, Del.

★ ★ ★

A.S.&W Changes at Cuyahoga Works

Three personnel appointments at the Cuyahoga Works, Cleveland, have been announced by **Albert J. Hoyt,** district manager of operations of the **American Steel & Wire Division of U. S. Steel Co.**

★ ★ ★

Walter L. Longnecker has been named general superintendent of the plant, succeeding **Nelson W. Dempsey,** who recently was appointed assistant manager of operations in the Chicago district. At the same time, **Earle L. Chamberlain** has been appointed division superintendent of the hot mills, succeeding Mr. Longnecker, and **William B. Dawson** has been promoted to Mr. Chamberlain's former post of department superintendent, rolling in the hot mills at Cuyahoga Works.

★ ★ ★

John C. Blake Succeeded by P. E. Kluttig at Phosphor Bronze

Arthur C. Wheeler, president of the **Seymour Manufacturing Company,** announces the resignation, effective January 1, 1952, of **John C. Blake,** general manager of the **Phosphor Bronze Corporation,** subsidiary of the Seymour Manufacturing Company. Mr. Blake was widely known and experienced in all phases of refractory alloys covering a range of wire, rod and sheet, the most famous being the Elephant Brand of the Phosphor Bronze Corporation.

★ ★ ★

Simultaneously the appointment of **Paul E. Kluttig** as general manager of the Phosphor Bronze Corporation was announced. For over 20 years Mr. Kluttig has been connected with the brass industry having been formerly associated with the **American Brass Company** and more recently with the Western Brass Mills, a division of Olin Industries.

★ ★ ★

C. E. Boak, Assistant to President at Plume & Atwood

Thomas I. S. Boak has announced the appointment of **Charles E. Boak** to the position of assistant to the president of **Plume & Atwood Mfg. Company.** In this position Mr. Boak will be responsible for coordinating the activities of the sales, production, engineering, and inspection departments in the Waterbury plant.

★ ★ ★

Mr. Boak comes to Plume & Atwood from the General Electric Company in Pittsfield, Mass. where he has been engaged in various engineering, production and supervisory positions for the past six years. Prior to this he was with the Army Ordnance Dept. attaining the rank of Captain.

★ ★ ★

He secured his Mechanical Engineering degree from Cornell University in 1941.

★ ★ ★

When wrapping your wire or rod

...REMEMBER

It's the

Crinkle in the PAPER that COUNTS!

For a tighter, more compact wrap, specify—
"Arksafe" CRINKLED KRAFT WIRE WRAP

Easy to handle, simple to apply. Uniform crepe—Strong and *Economical,* too!

CONSTRUCTION: Single ply, waxed, asphalt laminated and reinforced.

In Standard Rolls and Widths for use on all types of wrapping machines. Also available in Hand Rolls.

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Glass Fibers Appoints Sales Manager for Textile Division

Frank J. McLeod has been named sales manager of the textile division of **Glass Fibers Inc.** it has been announced by **R. W. Capaul,** general sales manager of the firm.

★ ★ ★

In his new capacity, Mr. McLeod will supervise sales of glass fiber products to the broad and narrow fabric industries, the plastics and reinforced paper industries, and to the wire and cable field.

★ ★ ★

He joined Glass Fibers in 1948 after extensive experience in the glass fiber and paper industries. Until his new appointment, he was manager of the plastics division.

★ ★ ★

C. L. Austin, New J. & L. President

C. L. Austin was elected president of **Jones & Laughlin Steel Corporation,** the fourth largest producer in the industry on January 29th. Mr. Austin, who is 50, was former vice president. Admiral Ben Moreell who has been both chairman and president will continue as chairman. Mr. Austin joined J.&L. as treasurer and director in 1942.

★ ★ ★

Mr. Austin's duties as executive vice president have been delegated to two men appointed to newly-created posts.

★ ★ ★

A. J. Hazlett, former vice president-sales, has been made executive vice president, distribution, and **John B. Mitchell,** formerly vice president-operations, has become executive vice president, production.

★ ★ ★

Bethlehem Has New G. M. at Johnstown

Retirement of **R. E. Hough** as general manager of **Bethlehem Steel Company's** Johnstown plant was announced early in January by **S. J. Cort,** vice president in charge of steel plants. Mr. Hough's retirement follows a career of more than forty-six years in the steel industry. At the same time, Mr. Cort announced that **A. J. Fisher,** who has been with Bethlehem since the "Twenties", has been appointed plant general manager, succeeding Mr. Hough.

★ ★ ★

A pioneer in the use of automatic controls in the steel industry, Mr. Fisher in the course of his work at Sparrows Point, was instrumental in designing or redesigning all of the plant's metallurgical furnaces for improved practice and for automatic control.

★ ★ ★

Engineer Joins Atlantic Steel

J. K. Stafford, electric furnace authority, joined Atlantic Steel Co., Atlanta.

★ ★ ★

J. C. Blake Named Director, Scrap Metal Mobilization Council

T. E. Veltfort, manager of the **Copper & Brass Research Association** and chairman of the Non-Ferrous Scrap Metal Mobilization Council, announced early in February the establishment of headquarters for the Council's scrap drive at 205 East 43rd Street, with **J. C. Blake** as its director.

★ ★ ★

It will be the function of this organization to encourage an increased flow of aluminum, brass, bronze, copper, lead, zinc, nickel and tin

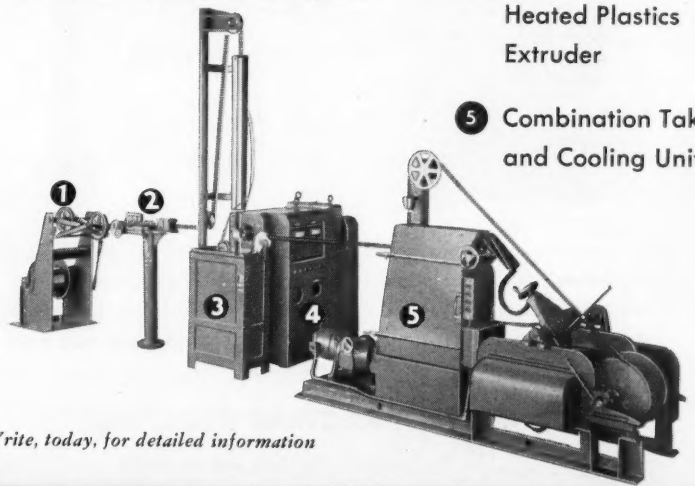
NRM

COMPLETE EQUIPMENT FOR COVERING WIRE WITH NYLON . . . . . .

Here's a "straight-line" production unit especially designed to give you faster, better covering of wire with Nylon. From the sturdy supply stand to the combination take-up and cooling unit, this NRM equipment is tailor made to give you the maximum output of accurately centered, smoothly covered wire at a minimum of cost and maintenance. A special metering type "torpedo" feed screw, a special Nylon crosshead, and extremely uniform heating are combined in a rugged 1½" electrically heated extruder to eliminate "pulsation" and to cover small gauge wire at high speeds and to close tolerances.

What's more, with a few simple changes this same equipment can be used with other wire covering plastics. The extruder, with built-in "Balanced Heat Control", need only be fitted with a different feed screw to handle a wide range of thermoplastics.

1. Supply Reel Stand
2. Wire Straightener
3. Vertical Wire Preheater and Cooling Tank
4. 1½" Electrically Heated Plastics Extruder
5. Combination Take-up and Cooling Unit



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Creative Engineering

scrap into the normal channels of distribution so that a greater quantity of these non-ferrous metals can be made available both for the manufacture of war armament and to remedy to some extent the critical shortage for civilian use. It will work closely with the National Production Authority and other governmental agencies in Washington as well as with industry in general.

★ ★ ★

Mr. Blake, the director, has had nearly 38 continuous years of service in the brass mill industry. He began in 1915 as a clerk in the wire mill of the Seymour Manufacturing Company, Seymour, Conn., from which he progressed through various positions to supervision of government contract scheduling during World War I. In 1925 he took charge of production and order scheduling with the Riverside Metal Company, Riverside, N. J., and later became general sales manager of that company. He left Riverside to become associated with the Phosphor Bronze Corporation, Seymour, Conn.

Mueller Brass Acquires Valley Metal Products

Fred L. Riggin, Sr., president of the **Mueller Brass Company,** Port Huron, Mich., announced the purchase of the Valley Metal Products Company of Plainwell, Mich. The new subsidiary will operate as a division of the parent company although retaining its own trade name of Vampco. The Valley Metal Products Company is engaged in the manufacture of aluminum windows for residential, institutional and commercial buildings as well as the extrusion of aluminum into special shapes. Present plans, as announced by Mr. Riggin, call for a continuance of the business as now operated.

★ ★ ★

Tyler Riggin has been named executive vice-president of the Vampco division; Donald O. Stiles, present general manager, is to remain in that capacity. Other officers of the new subsidiary are identical with those of the Mueller Brass Company.

★ ★ ★

The Mueller Brass Company, now in its 34th year of operation, is recognized as the world's largest manufacturer of brass forgings, and is the originator of the solder type fitting for use with copper tubing.

★ ★ ★

It also manufactures brass and copper rods, tubes, castings, screw machine parts and assembled products.

★ ★ ★

To Head Cleveland Office for Sheet and Tube

James A. Hale has been appointed district sales manager in charge of the Cleveland office for **The Youngstown Sheet and Tube Company,** succeeding F. A. (Ted) Olmstead who died Dec. 28.

★ ★ ★

General Cable Advances Two Men

Election of **S. A. Smith, Jr.,** as Treasurer and **Ralph W. Atkinson** as Director of Research of **General Cable Corporation** was announced recently by **Dwight R. G. Palmer,** Chairman of the Board.

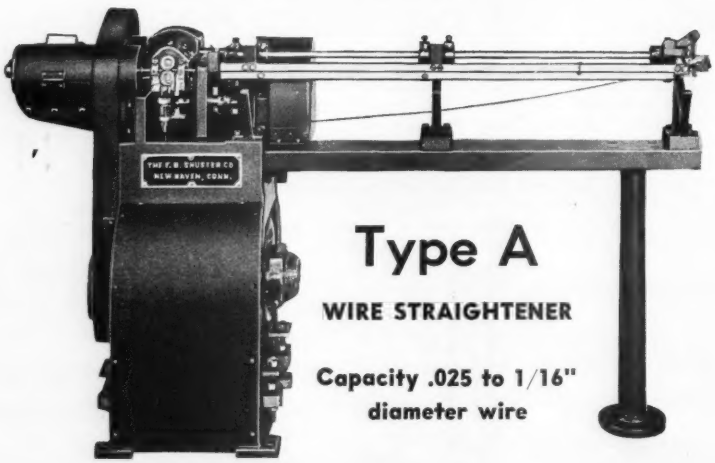
★ ★ ★

In making the announcement Mr. Palmer stated that both Mr. Smith and Mr. Atkinson have had broad experience in the corporation's business, having been associated with it for some years.

★ ★ ★

of course it's a **SHUSTER!**

AUTOMATIC ACCURATE AND ECONOMICAL



Type A

WIRE STRAIGHTENER

Capacity .025 to 1/16" diameter wire

This machine combines every major feature for which Shuster Wire Straighteners are noted. Outstanding advantages are faster feed, a greater cutting speed that delivers undistorted, square-cut ends, and a type of construction that is extremely rigid and wear resisting. Write us for details, now.

Mfd. by **METTLER MACHINE TOOL, INC.**

132 W. Lawrence St., New Haven, Conn.

Representatives in all principal cities and in foreign countries.

SHUSTER *Automatic* Since 1866 WIRE STRAIGHTENING AND CUTTING MACHINES

Dudley B. Robinson Made Torrington Vice-President

The Board of Directors of **The Torrington Manufacturing Company,** Torrington, Conn., have elected **Dudley B. Robinson** to the position of vice-president in charge of sales, S. W. Farnsworth, president, has announced.

★ ★ ★

Mr. Robinson joined Torrington in 1949 as sales director of the air impeller division and had advanced to position of general sales manager, prior to this election.

★ ★ ★

Torrington manufactures propeller-type fan blades and centrifugal blower wheels, rolling mill equipment for ferrous and non-ferrous metals as well as slab molds and spring making machinery.

★ ★ ★

Phelps Dodge Appointments

Phelps Dodge Copper Products Corporation has announced four appointments in their sales department. They are: **Fabian W. Kunzelmann,** Manager, Electrical Manufacturer Sales; **Carl D. Dimity,** Manager, Utility Sales; **William K. Dunbar, Jr.,** Manager, Electrical Distributor Sales; and **John C. Williams,** Manager, Rod and Wire Sales.

★ ★ ★

These positions have been newly created as part of the development plan for the customer contact organization of the company, and these appointments do not represent any replacement of executive personnel. All four of the newly appointed executives have been with the company for a considerable period of years.

★ ★ ★

Grosse and Larkin Elected By Broderick & Bascom

At the regular annual meeting of the shareholders of **Broderick & Bascom Rope Company,** held in St. Louis in January, **David Larkin,** former executive vice-president of the company, was elected to the board of directors.

★ ★ ★

At the meeting of the new board for the election of officers, **A. A. Grosse,** who has been assistant treasurer, was elected to the additional office of secretary, a position formerly held by **Joseph H. Bascom,** now executive vice-president and treasurer. Mr. Grosse's connection with the organization dates back to November, 1925.

★ ★ ★

Chase Names Rochester District Manager

Frederick K. Pulsifer has been appointed district manager, Rochester, N. Y., office, **Chase Brass & Copper Co.,** Waterbury, Conn. Mr. Pulsifer, will replace **Charles L. Moseley** who will be transferred to the general sales offices in Waterbury.

Arcrods Elects New Officers

W. E. Brainard was elected president and director of **Arcrods Corp.,** New York, replacing **J. H. Humberstone,** who becomes chairman of the board. **C. A. Wagner** was appointed controller.

★ ★ ★

Leschen Appoints New York District Manager

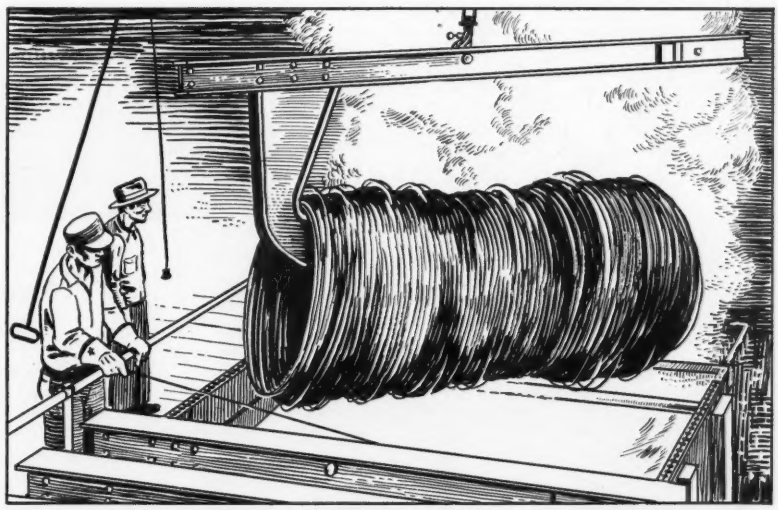
L. J. Clarke was appointed New York district manager for **A. Leschen & Sons Rope Co.**

THERE'S A SPECIFIC NEP INHIBITOR

FOR YOUR PICKLING DEPARTMENT

Use NEP #33 INHIBITOR [Non-Foaming Liquid] and add SUMFOAM COMPOUND for foam blanket, or use NEP #47 INHIBITOR (Powdered Foaming Product).

These products have been tested, used and approved by major wire mills everywhere!



For better pickling AT LESS COST use NEP INHIBITOR, made by the producers of SUMFOAM COMPOUND and NEPTUNE PICKLING ACCELERATOR.

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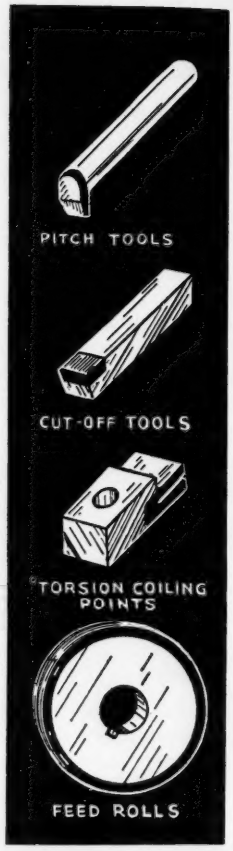

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Please enquire for our detailed catalogue-sheet which will inform you about working ranges and employments of our Multi-Slide Bending Automatics.

A Review of Recent Wire Patents

No. 2,580,542, MACHINE FOR GRINDING THE ENDS OF COILED SPRINGS, Patented January 1, 1952, by Harold Frederick Heath, Redditch, England, assignor to W. J. Llewellyn Limited, Redditch, England.

The object of the invention is to provide supporting structure or frame which enables lateral traversing in the horizontal plane to be effected between a grinding wheel and a feed plate.

★ ★ ★

No. 2,580,749, REEL FOR WIRE STITCHING MACHINES, patented January 1, 1952 by Arnold F. Fischer, New York, N. Y.

One of the heads of the reel is detachable from the reel hub.

★ ★ ★

No. 2,580,792, WIRE COILING MACHINE, patented January 1, 1952 by Per T. Karlsson Smogen, Sweden.

The machine is arranged to effect a substantially even distribution of a wire strand on a coiling drum.

★ ★ ★

No. 2,580,801, METHOD OF MAKING LUSTROUS STEEL MUSIC WIRE, patented January 1, 1952 by William E. Leonard, Worcester, Mass., assignor to The American Steel and Wire Company of New Jersey, a corporation of New Jersey.

After the electrodeposition of tin on wire of a diameter greater than that of the finished wire, the wire is drawn through a die having a hole smaller than the wire's diameter and the wire is reduced to proper size and the luster of the tincoating is increased.

★ ★ ★

No. 2,580,872, VENTILATOR FOR HAY AND GRAIN CONTAINERS, patented January 1, 1952 by Clarence L. Wise, Springfield, Ohio.

An air conduit is provided comprising a number of coils of wire, one end of each having a sleeve and the other end of each coil being threaded onto the sleeve end of the adjacent coil.

★ ★ ★

No. 2,581,042, NAIL PACKAGING MACHINE, patented January 1, 1952 by Stuart Otto, New York, N. Y.

This is a magnetic type of machine there being magnetic poles of opposite polarity to generate parallel lines of force through the nail holding chamber.

★ ★ ★

No. 2,581,180, APPARATUS FOR STRIPING WIRE, patented January 1, 1952 by James L. Entwistle, Cranston, and Alden W. Nelson, Pawtucket, R. I., assignors to The James L. Entwistle Co., Pawtucket, R. I., a copartnership composed of James L. Entwistle and Margherita C. Entwistle.

More specifically the invention resides in a marking head for a wire stripping machine.

★ ★ ★

No. 2,581,472, MULTIPLE CONDUCTOR INSULATED WIRE, patented January 8, 1952 by Raymond H. Dudley, Guilford, and Carl A. Larson, Hamden, Conn., assignors to The Whitney Blake Company, Hamden, Conn. a corporation of Connecticut.

An object of the invention is to provide a sheath for two spaced apart and individually insulated wire conductors, which sheath may be readily separated so each conductor and its insulation covering can be used as needed.

★ ★ ★

No. 2,581,686, SPRING CONSTRUCTION, patented January 8, 1952 by Edward L. McRoskey San Francisco, Calif.

Rows of wire coil springs are provided, with one terminal core of each spring having two opposed straight lapping sections, with the section of one coil connected with the lapping section of the next coil by a small coiled wire.

★ ★ ★

No. 2,581,761 SPRING ATTACHMENT MEANS, patented January 8, 1952 by Joseph D. Haas, Memphis, Tenn., assignor to U. S. Bedding Company, Memphis, Tenn., a corporation of Georgia.

This spring assembly includes a pair of spaced parallel rails a number of wire spring elements spanning the distance between the rails, each element including at its opposite ends opposed curbed hook portions, each terminating in a free tip, a like number of pockets having opposite sides formed in each rail, each pocket housing a hook portion with the free tip of the housed hook abutting one side of the interior of the pocket and the curve of the hook abutting the opposite side of the interior of the pocket, this spring element being thereby attached to the

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STRAIGHTENING and CUTTING

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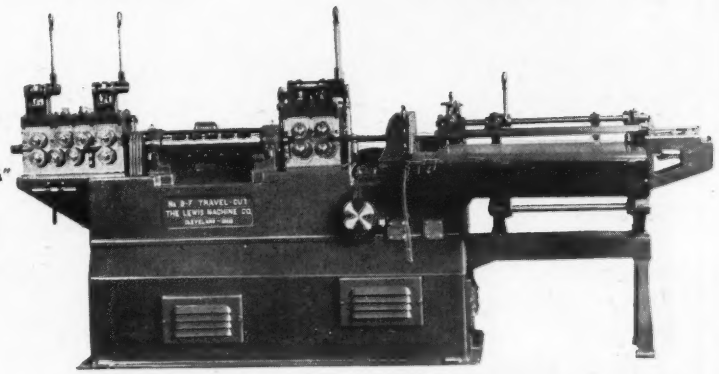
MACHINES



22 Models to handle from 1/16" to ¾" Round, Hex, Flat, Shapes.

Simple in design, rigid in construction, Lewis TRAVEL CUT will deliver continuous dependable service under the most severe, high production conditions—day in, day out. Feeds wire from the coil, straightens accurately, gauges to uniform length, and cuts clean without stopping the wire. For steel, brass, aluminum and alloy wire. Cut your cutting costs with the Lewis TRAVEL CUT. Full details on request.

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CANADIAN: Empire Engineering Co., 11 Wellington St. E., Toronto 1, Ontario.

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rails.

★ ★ ★

No. 2,581,779, SCOURING PAD AND PROCESS OF MANUFACTURING THE SAME, patented January 8, 1952 by Lewis Crowford Abraham, Auderghem-Brussels, Belgium.

Here the process comprises rolling upon itself from both ends inwards a tubular section of wire net thus forming two adjoining rolls, turning these rolls inside out, constricting the annulus thus obtained, and securing it at the constriction.

★ ★ ★

No. 2,582,576, WIRE FORMING MACHINE, patented January 15, 1952 by Andrew Max Zweyer, Los Angeles, Calif., assignor, by mesne assignments, to Zig Zag Spring Co., a corporation of California.

There are ten claims to this machine which includes a block having a pair of pins projecting therefrom in parallel relationship with the axis of the block, a device to direct wire stock to be formed over the block between the pins, means to turn the block upon its axis, shifting one of the pins into engagement with one reach of the wire stock to advance the stock a predetermined distance over the block and move the other of the pins into engagement with a different reach of the stock to bend the latter around the first-mentioned pin.

★ ★ ★

No. 2,583,091, BALING HOOK, patented January 22, 1952 by Ben Oni Dotterer, Mansfield, Ohio.

The hook is constructed a single length of rod or heavy wire stock, bent to shape.

★ ★ ★

No. 2,583,237, CORSAGE FRAME, patented January 22, 1952 by Michael Stegena, Steubenville, Ohio.

This holder is composed of a number of wire strands having coiled ends.

★ ★ ★

No. 2,583,667, REEL FOR SUPPORTING WIRE COILS, patented January 29, 1952 by John William Pratt, Leicester, England, assignor to United Shoe Machinery Corporation, Flemington, N. J., a corporation of New Jersey.

Loading of the wire coil upon the coil receiving members of the reel arms is said to be facilitated by the specific arrangement of these members.

★ ★ ★

No. 2,584,027, DRILLING CABLE WITH INSULATED CONDUCTOR, patented January 29, 1952 by John F. Kendrick, Columbus, Ohio.

About the high tensile strength coil is a layer of laterally abutting bare wire strands helically disposed around this core in contact therewith so as to form a number of continuous helical grooves of the same direction of lay and the strands between adjacent strands and the core, and an insulated electrical conductor positioned in at least one of these grooves.

★ ★ ★

To Make Styroflex Tapes

Styroflex tape for insulation use in the Heinz Horn coaxial cable will be manufactured in the United States by **National Varnished Products Corporation**, Woodbridge, N. J., according to **Lowell Bellingham**, assistant sales manager of the company.

★ ★ ★

Manual on Electro-Analysis Offered

A new, 20 page manual outlining methods for the analysis of copper and lead by electro-analysis has been prepared by **Eberbach Corporation**, Ann Arbor, Michigan, for distribution with its Electro-Analysis Apparatus. The methods and extensive bibliography are a product of research at Battelle Memorial Institute. Because this booklet can be helpful to all laboratories performing such analyses, copies are available upon request at no charge.

★ ★ ★

Detroit Steel to Expand

Detroit Steel Corporation recently announced plans for its $55 million expansion program, for which $19 million has already been spent or appropriated.

★ ★ ★

The new facilities will include a second blast furnace rated at 1400 tons, four additional open hearth furnaces of 250 tons capacity each, a new high lift 48″ blooming mill, a new five-stand 54″ hot strip mill, a new three-stand 54″ cold rolled sheet mill, along with additional soaking pits, annealing furnaces,

WIRE SPOOLS, ALL-STEEL, LITHOGRAPHED

Ends and traverses may be shipped separately and assembled easily in your plant on a hand, foot, or power press.

5″ and 6½″ diameter ends with 1-15/16″ diameter traverses.
10½″ diameter ends with 3½″ diameter traverses.
Traverse lengths up to 12″.

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pickling, slitting and cut-off lines, and other related equipment.

★ ★ ★

The Company is already producing wire and wire products with a capacity of 180,000 tons annually. It also owns and operates two metallurgical coal mines in Kentucky. Its cold rolled strip mills at Detroit, Michigan and New Haven, Connecticut have a combined annual capacity of 220,000 tons.

★ ★ ★

On completion of the expansion program in 1953 Detroit Steel will have the following product capacities annually: coke, 550,000 tons; pig iron, 768,000 tons; steel ingots, 1,290,000 tons; substantial quantities of coal chemicals (ammonia liquor, benzol, crude tar, creosote, pitch coke, etc.); wire and wire products, 180,000 tons; hot rolled and cold rolled sheet steel, 900,000 tons; cold rolled strip steel, 220,000 tons.

★ ★ ★

Mettler Announces New Feed Starter

Mettler Machine Tool, Inc., New Haven, Conn., manufacturers of Shuster automatic wire straightening and cut off machines, announce an addition to the Shuster line of wire handling equipment.

★ ★ ★

The new Shuster Feed Starter is for straightening and feeding the starting end of rod from coil. Previously, starting the end of 5/8" coiled steel rod into a header or other wire working machine was hard, dangerous hand labor. Now, with practically no physical effort, the operator positions the coil up to the Feed Starter, lets the power feed roll get a bite on the extreme starting end and the rod is automatically fed through the attached roll straightener, ready for the next production operation. When the straightened stock reaches the pulling device on the next machine (header, press, etc.) the feed rolls are backed off, letting that machine pull the rod through the straightening rolls.

★ ★ ★

Feed rolls have two grooves to accommodate different diameters of wire up to 5/8", or can be supplied for square stock. Control is by means of a stop, start and reversing switch, mounted on the right hand side of the unit, convenient to the operator. Rate of feed is 68" per minute.

★ ★ ★

The drive consists of a 3/4 HP motor, driving a speed reducer through V belts, and the speed reducer drives the feed roll shafts through a double roller chain.

★ ★ ★

The Shuster Feed Starter is also available without attached roll straighteners where production line machines are already straightener equipped.

★ ★ ★

New Inertialess Weighing System Gives Tester Constant Rate of Extension

Scott Testers, Inc., Providence, R. I., announce an entirely new electrical weighing system for application to existing Scott Testers of the pendulum type.

★ ★ ★

This new Inertialess Weighing System replaces the conventional pendulum type head and recorder, converting the tester from constant-speed-of-pull operation to constant-rate-of-extension.

★ ★ ★

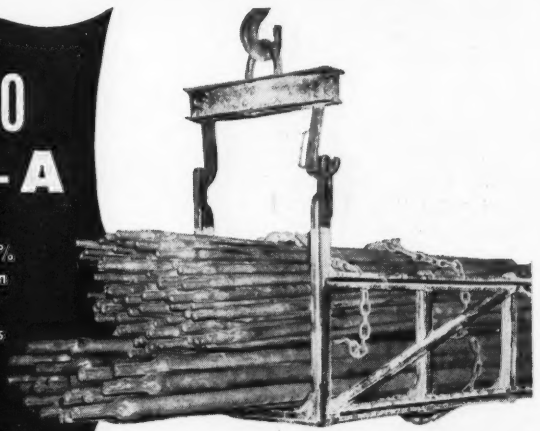
NOPCO 1067-A

★ saves over 30% sulfuric acid solution in pickling of iron, steel and nonferrous metal products

★ aids processing

★ speeds production

★ assures improved output



Add Nopco 1067-A to the pickling bath, and you reduce loss of sulfuric acid solution through carryover to the rinsing tank by 30% to 40%.

Here's a definite economy, of outstanding benefit today when current restrictions limit the use of sulfuric acid.

But Nopco 1067-A not only effects high drainage, it also affords such important advantages as these:

★ ***faster, deeper, and more uniform penetration of oxide scale—resulting in elimination of pitting, lower metal losses, and smooth, clean surfaces after pickling***

★ ***reduced operating time and lower costs—since better drain-off means fewer rinsings for complete acid removal***

★ ***reduced acid contamination in operations following pickling—with the result that tool and die life is increased***

★ ***easier acid disposal—since acid is localized in first tanks***

In a word, addition of this unique surface tension depressant to your sulfuric acid pickling solutions not only means *money in your pocket,* but more satisfactory products coming off your production line.

LET US TELL YOU ALL ABOUT NOPCO 1067-A. MAIL THE ATTACHED COUPON TODAY.

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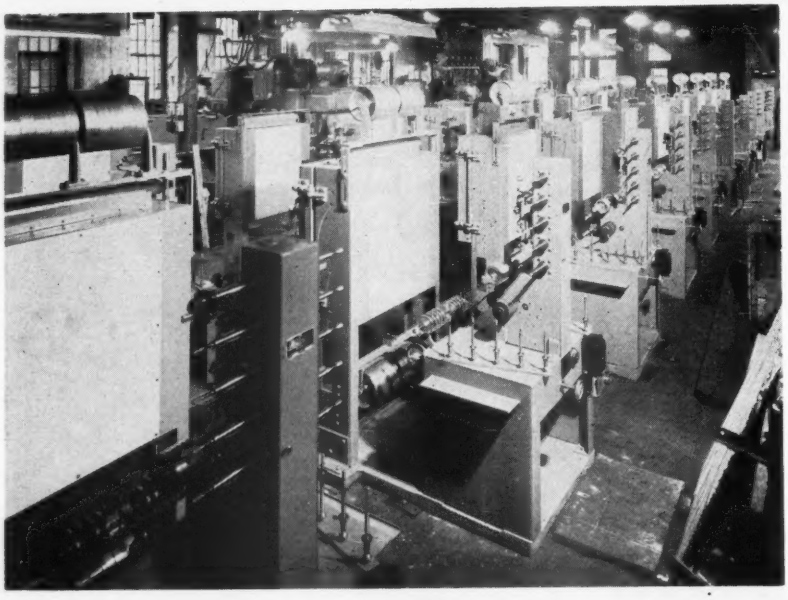

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BUILT ESPECIALLY TO APPLY ENAMEL TO EXTRA FINE DIAMETER WIRES. ELECTRIC HEATED OVEN, AUTOMATIC TEMPERATURE CONTROL. TAKE-UP REEL STAND EQUIPPED WITH SPEED VARIATOR TO CHANGE WIRE SPEED. MOTORIZED TRAVERSE MOTION. TAKE-UP AND SUPPLY REEL STAND WILL ACCOMMODATE UP TO 4" MAX. DIA. REELS.

WIRE DRAWING, ENAMELING TINNING, INSULATING, TAPING, GLASS-COVERING, PANNING, AND ALLIED MACHINERY.

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Wire Netting Machines for Chain Link, Hexagonal Mesh, Poultry Netting, Field Fence. Crimping, Barb Wire and Staple Machines. Spring Coilers. Spring End Grinding Automatics. Loop Benders. Upholstery Spring and Wire Mattress Machines. Wire Nail Machinery. Chain Formers. Chain Welders. Straightening and Cutting Machines. Multi-Slide Wire and Strip Forming Machines. Special Machinery for the making of Paper Clips, Lock Washers, Bale Ties, Key Rings, Tin Openers, Wire Bag Ties, etc. Automatics for Flexible Metallic Tubing.

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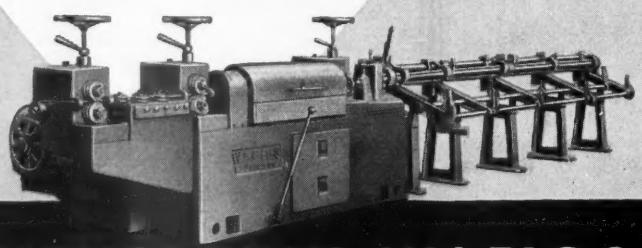
WAFIOS

SINCE 1893



MASCHINENFABRIK WAFIOS

WAGNER, FICKER & SCHMID REUTLINGEN 3 / WURTT. GERMANY

Resistance of the specimen, or load, is absorbed by the deflection of an elastic spool, which is converted to a voltage and measured by a potentiometer with recording chart. On the chart, extension of the specimen is shown vertically and load horizontally. Inasmuch as chart speed and clamp speed are both time functions, the chart becomes a stress-strain diagram directly, with either variable (load or extension) magnified or condensed as desired.

★ ★ ★

The advantages of the new system are: **First,** inertia is practically eliminated from the weighing mechanism. The improved sensitivity reflects the behavior of the specimen in more minute detail, particularly when minute changes are magnified as described above. **Second,** it is now possible to apply a constant rate of extension. **Third,** the flexibility of drive and recorder rates and wide range of chart speeds available, permits new studies of progressive test stages.

★ ★ ★

Application of the new system to existing Scott Testers is extremely simple. The replacement, which can be made by non-mechanical personnel, requires about a half hour, consisting of removing the pendulum head by loosening four bolts and installing the new elastic spool head with the same four bolts. With equal ease, the potentiometer recorder replaces the old recorder. Current is applied by plugging into any 110-120V outlet.

★ ★ ★

In operation, the specimen is inserted in the tester clamps in the usual manner, and the chart pointer adjusted to zero for the existing tare load. The driving mechanism is then set in motion, extending the specimen by moving the lower clamp downward at a uniform predetermined rate of speed. At the same time, by synchronized automatic action, the chart paper commences its downward travel at its predetermined speed. For literal stretch recording, the speed of travel of the chart can be equalized with the speed of travel of the moving clamp. Travel speeds of .1″ to 20″ per minute are presently available.

★ ★ ★

As the specimen is extended, the elastic spool in the head weighs the load by its deflection. This deflection is reflected in the horizontal scale, graduated from 0-100, as illustrated. The maximum deflection of the elastic member under maximum lb. load plus tare, is .0015″, so that this has no practical effect on the recorded extension of the specimen. The accuracy of the system is 1/4 of one per cent of the span, or better. Minimum zero drift is an important feature of control contributing to this high accuracy.

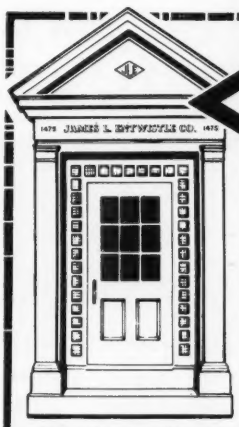
★ ★ ★

As to capacities, conversions are available from 2 to 10 lbs. to 400-to-2,000 lbs. The change from one capacity to another is readily accomplished by changing the elastic member rather than the entire head. This again can be accomplished by non-mechanical personnel, without special tools.

★ ★ ★

Further details may be obtained from Scott Testers, Inc., 155 Blackstone St., Providence, Rhode Island.

★ ★ ★



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- Caterpillar Pull-outs
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- Pneumatic Equipment and Controls
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- Hi-Pot Test Sets
- Cable Handling Equipment for Warehouse Use

See Page 248 for news of the JLE Heavy Duty Reel Take-Up.

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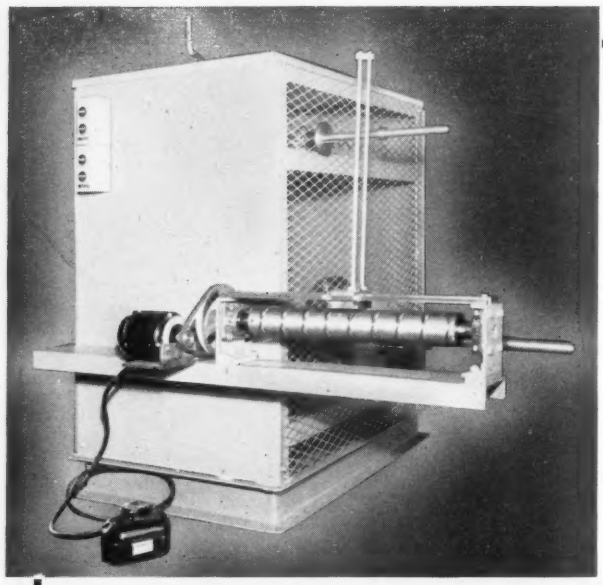

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This FEDERAL RE-SPOOLING MACHINE is made of the best materials and finest workmanship. Built for efficient operation.

FEATURES are variable speed ratio up to 16 to 1 with variable speed starting torque at all speeds. Will not break or stretch your wire. Equipped with air or electric brake, as desired, to prevent over-running.

Furnished with or without controls so that it can be used separately or with your Spark Tester.

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Prompt deliveries. Send for details.

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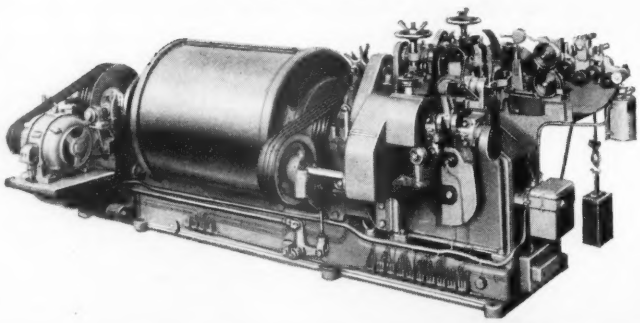
MACHINES FOR MAKING STEEL SCREWS: Double Stroke Heading Presses, Head Trimming and Shank Reducing Machines, Machines for Rounding off the End, Screw-Head Slotting Machines, Thread Rolling Machines, HIGH EFFICIENCY HIGH SPEED WIRE NAIL PRESSES — ROOFING NAIL MACHINES — MACHINES FOR MAKING SHOE TACKS: Cut Tack Machines, Wire Tack Machines.



MACHINES FOR MAKING WOOD SCREWS: Single Stroke and Double Stroke Presses, Head Turning and Slotting Machines, Thread Cutting Machines, Thread Milling Machines, WIRE FORMING MACHINES — STAPLE MAKING MACHINES — HIGH SPEED BARBED WIRE MACHINES — Wire Straightening and Cutting Machines.

High Speed Barbed Wire Machine Type BSD (Teful)

Inquiries are invited to

J. G. KAYSER, Maschinenfabrik, NURNBERG, GERMANY

New Quartz Fiber Now Being Made

Quartz, the crystalline form of silica and the most perfect electrical insulating material found in nature, has been duplicated chemically in the form of fibers, according to an announcement by **Randolph H. Barnard,** president of **Glass Fibers Inc.**

★ ★ ★

The company has produced a highly specialized glass fiber, in the submicron-diameter size, that has been successfully made into a quartz paper. The initial use of the new paper will be as a high-temperature, non-deteriorating electrical insulating material. It is chemically identical with the nature-found quartz, that has long been regarded by science and industry as the finest insulator known.

★ ★ ★

Publicly-announced defense requirements for perfect insulating paper have included high temperature needs of over 1,000 degrees Fahrenheit, low electrical losses at high frequencies and, perhaps most important, absolutely no deterioration when exposed to atomic radiation.

★ ★ ★

Quartz paper, made from the new glass fibers, has high temperature resistance up to 3,000 degrees Fahrenheit, provides minimum electrical losses at high frequency and, in extensive tests, has proven relatively unaffected by radiation.

★ ★ ★

It has strategic importance as a replacement for asbetsos and with a temperature limit for the paper of 3,000 degrees F., it greatly surpasses the accepted working limit for asbestos. In addition, it does not break down chemically as is sometimes the case with asbestos and is absolutely magnitite-free.

★ ★ ★

The new material will be used as wrapping insulation on all types of wires, cables and components used in the radiation field, including coaxial cables, magnet wire, hook-up wire and wave guides.

★ ★ ★

The basic glass fibers to be used in making quartz paper are available to paper manufacturers only in small laboratory quantities at present.

★ ★ ★

Bulletin On Roll Marker Available

A technical bulletin (#500-C) covering its improved Model "C" automatic roll marker for screw machines has been issued by **New Method Steel Stamps, Inc.,** 147 Jos. Campau St., Detroit 7. The Model "C" has become the company's standard production model roll marker for screw machines.

★ ★ ★

The simple manner in which the roll marker can be used to eliminate secondary operations, improve marking clarity, and reduce costs is described and illustrated, including instructions for operation, setup, use of offset dies, correct locating of starting pad, ordering markers or dies, etc.

★ ★ ★

Steel Being Extruded Cold

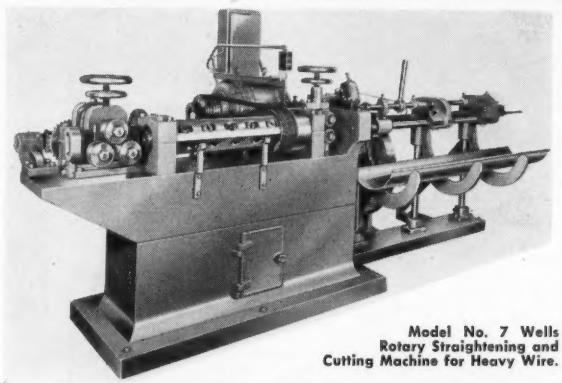
Steel now can be pushed rapidly through a die, while cold, to form cylindrical products. Contrary to beliefs that steel required heat for such operations, cold extrusion has been found applicable under certain conditions—with giant power. New

FAST — DEPENDABLE

WELLS' STRAIGHTENER and CUTTER

For HEAVY Wire

The Model No. 7 illustrated is WELLS' ROTARY STRAIGHTENING AND CUTTING MACHINE for heavy gauge wire. It is designed to handle 1/4", 5/16", 3/8", 7/16" and 1/2" wire at speeds of 90' to 100' per minute on long continuous production runs.



Model No. 7 Wells Rotary Straightening and Cutting Machine for Heavy Wire.

The flier runs in ball bearings, and all wearing parts are made of tough steel castings to give a maximum of service, durability, and strength.

Other WELLS' MACHINES are made to handle smaller gauges of wire at speeds correspondingly higher.

Backed by 57 years of experience in making good straighteners and cutters, every WELLS' Machine may be depended upon to give long, steady and satisfactory service and will do tough jobs that many others will fall down on. The reason—good design, finest workmanship, best materials and experience.

Send today for Catalog No. 50 describing the full WELLS line.

Frank L. Wells Company

5821 FIFTH AVENUE

KENOSHA WISCONSIN

Builders of Fine Wire Making Machinery

developments in dies and lubricants make it possible, with discoveries of the plastic nature of cold steel whereby the metal can be made to flow rapidly.

★ ★ ★

Extrusion is a process by which pressure pushes a material through a die in contrast with drawing, which pulls a metal through, exerting a stretching stress. High pressure and confinement make the metal ductile or plastic. Softer metals have been extruded for many years.

★ ★ ★

In some quarters cold extrusion is regarded as a highly important metallurgical development. On account of die expense, the process is limited to products in large production, but now is winning extensive adoption.

★ ★ ★

For cylindrical shapes, such as artillery shell cases and shock-absorber parts, it is asserted by advocates of cold extrusion that it accomplishes four desirable results: substantially improves mechanical properties of the metal through cold working; saves much machining because of the extremely close tolerances to which pieces are made; the extremely smooth surface produced by the process usually makes further finishing unnecessary; as practically all the metal in the slug enters into the finished extrusion there is very little scrap and so steel is conserved.

★ ★ ★

Bulletin Announces New Wire Straightener and Cutter

In a bulletin issued by the **Medart Company**, 3535 DeKalb St., St. Louis 18, Mo., a new straightening and cutting machine, said to be really new and different, is described and illustrated. It is called the Medart Supermatic Wire Straightening and Cutoff Machine.

★ ★ ★

Features are the Hydra-Electric Automatic Cutoff and the Roto-Die Spinner, for which are claimed speeds and close tolerances in cutting not heretofore available. The company has spent several years in engineering, developing and testing these new machines before making the announcement.

★ ★ ★

The mechanical features represent a number of departures in design from conventional types of machines, are fully automatic, are compact and efficient and provide speeds and accuracy in excess of presently available similar equipment. Speeds vary from 100 F.P.M. on 1″ stock to 200 F.P.M. on 1/16″ wire. A full description is found in the bulletin, which may be secured by writing to the company.

★ ★ ★

Carboloy's Long Strike Settled

The first strike in Carboloy's 23 years of business lasted for 20 weeks. Perhaps the length indicates the importance of the main issue involved: Their right to move operations to other locations and the freedom to select those whom to employ at new locations, while providing reasonable protection for employees affected by such moves.

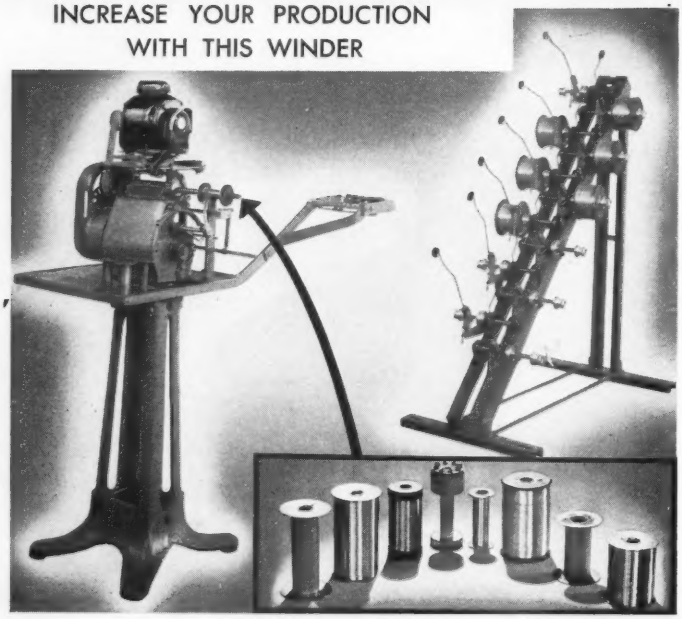
★ ★ ★

Full agreement was reached late in January by the company and union negotiators. After a strike of this length, it will require a while for Carboloy to get back into full production.

★ ★ ★

STANDARD UNI-DRIVE WIRE WINDER.

INCREASE YOUR PRODUCTION WITH THIS WINDER



Various types of supply packages that may be wound on Standard Uni-Drive Wire Winder.

PAYOFF

Our payoff attachment is made with self-aligning ball bearings and a compensating attachment to control the tension of each end. Applies same tension when spool is empty as when full.

OUTSTANDING FEATURES ARE:
Traverse adjustable to various distances between spool heads — from 1⅝″ to 5″ without changing cam; winds up to 12 ends of wire on each spool; Automatic stop motion for each strand of wire; winds ends evenly in flat ribbon in perfect alignment with spool heads; each strand of wire lays parallel with no under-winding, overwinding, tight or loose spaces, starts gradually; driven by ¼ HP Motor for 110 volt single phase 60 cycle AC current.

STANDARD MILL SUPPLY
PAWTUCKET, R.I., 1064-1080 Main St.
NEW YORK, N.Y., 6708 Empire State Bldg.
CHARLOTTE, N. C., 2319 Hutchison Ave.

New Catalog of Aircraft Cable, Terminals And Assemblies

A new revised Catalog of Aircraft Cable, Terminals and Assemblies has been released by **Macwhyte Company,** Wire Rope Manufacturers, Kenosha, Wisconsin.

★ ★ ★

Complete specifications conforming with the latest Military specifications are shown for "Hi-Fatigue" Control Cables for all types of aircraft. Macwhyte "Safe-Lock" and "Socketype Terminals" are catalogued in conformance with government standards. In addition, Macwhyte Tie Rods and Terminals are listed, described and illustrated.

★ ★ ★

A copy may be secured by addressing Macwhyte Company, Kenosha, Wisconsin, and requesting Catalog A-2.

★ ★ ★

New Wire Compound Catalog by Solar

Solar Compounds Corporation and **Solar Varnish Corporation** of Linden, New Jersey, leading manufacturers of coatings, compounds and varnishes for electric wire and cable, paints for industrial use and protective coatings for paper—have just announced the completion of a new compounds catalog that is reputed to be one of the most complete presentations ever offered to the wire field.

★ ★ ★

The catalog contains a complete pictorial presentation of Solar's laboratory and plant facilities; a detailed description of all major testing methods; product end uses; description and composition; methods of application; characteristics after application, and other valuable technical and general information.

★ ★ ★

Copies of the new Solar catalog are available to executives and technical men upon written request to Solar Compounds Corporation or Solar Varnish Corporation, 1207 West Blancke Street, Linden, New Jersey.

★ ★ ★

Catalog on Aluminum Extrusions Published in England

An exceptionally fine piece of letterpress work has been put out in the form of a new catalog issued by High Duty Alloys, Ltd. of Slough, England. It is entitled "Extrusions in Hiduminium".

★ ★ ★

In the book, the aluminum alloys are described and a large variety of extruded shapes are illustrated. The several chapters into which the book is divided cover bars, angles, channels, beams, tees, tubes and miscellaneous sections. Full technical and property data are supplied, with appendices that include a section of tables and a detailed index. The book is a work of art as well as a useful compendium of information on the subject to which it is devoted.

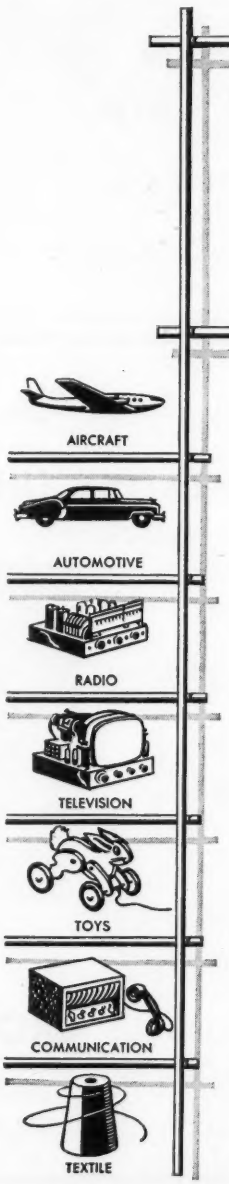
★ ★ ★

NOW IS THE TIME
TO ORDER YOUR
1952 WIRE AND WIRE PRODUCTS BUYERS' GUIDE

Completely revised, with many hundreds of changes in addresses, new products, new listings, etc.

To be published on April 1st.

Place your order now to be sure of getting a copy. The price is $5.00. Discount of 40% to WIRE & WIRE PRODUCTS subscribers. Order from WIRE & WIRE PRODUCTS, 453 Main St., Stamford, Conn.



precision wire straightening and cutting for all industry...

Whenever your wire straightening or cutting problem calls for close tolerances and uniform quality, it will pay you to take advantage of Pittsburgh Cut Wire's long experience to all industry. Expert workmanship and exact machining to your specifications for more than a decade, combine to give you the experience that will serve you best. Call on us for your wire straightening and cutting needs.

Straightening & Cutting in diameter ranges from 1/16" to .005" in all types of wire.

Pittsburgh cut wire company

1120 Galveston Ave. Pittsburgh 12, Pa

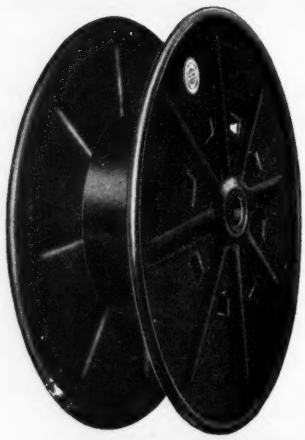
MOSSBERG PRESSED STEEL CORP.

Greater service from a new **ALL WELDED STEEL TAKE OFF REEL** designed to meet present day requirements.

Usual maintenance expense eliminated by adoption of this new design wherein all parts are welded into one homogeneous unit.

Reel sides are embossed with radial reinforcing ribs for increased rigidity with rolled edges for additional strength and to facilitate handling.

Complete line of spools and reels for both processing and shipping all kinds of bare and insulated wires and cables.



All Welded Steel
Take Off Reel

MOSSBERG
Pressed Steel Corp.
18 WEST STREET
ATTLEBORO, MASSACHUSETTS, U. S. A.

Telephone:
Attleboro
1-0847 & 1-0848

James Day (Machinery), Ltd., 28 Maddox Street, London WI, England

#102

Use "ALBRO" METAL *for Long Life and Economy in Pickling*

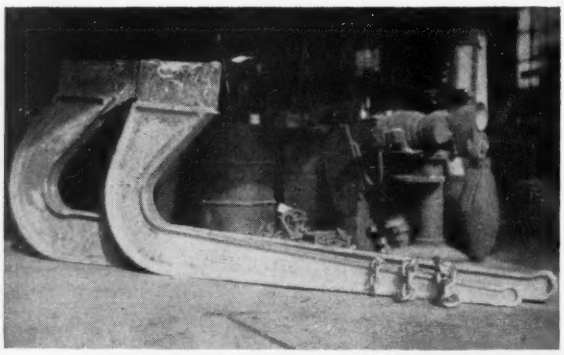
for: HAIRPIN HOOKS • PICKLING CHAINS • BASKETS, ETC.

They last! You can cut your hook costs in half. "ALBRO" METAL IS extremely resistant to acid corrosion — and very strong.

One customer used our hooks for 5 years and ordered 20 more—the corrosion over that period had been negligible.

We extend to you an opportunity to avail yourselves of our engineering co-operation. We build to your specifications.

Send us your drawings. Or wire, write or telephone, asking to have a representative call on you.



Other "ALBRO" METAL products are: CRATES AND HANGERS, BOLTS & NUTS.

ALBRO METAL

BRONZE DIE CASTING CO.
Franklin St. At Ohio River
PITTSBURGH 33, PA.
Tel.: CEdar 1-5987-8

Keystone's Steel Capacity Increased One-Third

Last Fall, one year after construction was started, **Keystone Steel and Wire Company's** new open hearth furnace began producing steel. This furnace will add approximately 100,000 tons to their annual steel capacity. Keystone has been making steel since 1917, starting at that time with three open hearths of 75 tons capacity each. The new furnace will enable them to top 170 ton heats.

★ ★ ★

Expansion in soaking pits, blooming mills and other departments is currently under way to enable the company to finish the steel produced by the new furnace. The new open hearth embodies the latest developments in furnace construction, and other furnaces will be similarly improved to secure greater efficiency in production.

★ ★ ★

American Wheelabrator Announces Promotion

American Wheelabrator & Equipment Corporation, Mishawaka, Indiana, manufacturer of Dust Collectors and Abrasive Blasting Equipment, announces the promotion of **Andrew B. Stevens** to the position of Assistant Factory Manager. He has held the position of Supervisor of Production Control and Stores with the company for the past six years.

★ ★ ★

Bulletin on Diamond Powders

Union Wire Die Corporation, 71 West 45th St., New York 19, N. Y., has issued an informative bulletin entitled "Diamond Powder".

★ ★ ★

In the bulletin 10 different diamond powder grades are listed, giving mesh, microns, U. S. B. S. grading, the old numerical grading and the recommended uses of different grades for diamond dies and tungsten carbide dies.

★ ★ ★

Space is also devoted to how and why Union's diamond powders are dependable and efficient, what to ask for if ready-mixed powders are wanted and to their diamond powder reclamation service—an important factor in cutting the cost of diamond powder use.

★ ★ ★

Copies of the bulletin will be furnished by the company upon request.

★ ★ ★

F. W. Reynolds, Jr. Joins Sprague Electric

Appointment of **Frederick W. Reynolds, Jr.** to the application engineering staff of the New York office of the **Sprague Electric Co.** has been announced by **Julian K. Sprague**, vice-president.

★ ★ ★

Mr. Reynolds was formerly with the Allen B. DuMont Laboratories, Passaic, N. J. He is a graduate of Union College, Schenectady, N. Y.

★ ★ ★

Reliance Adds to Boston Office

Appointment of **Norman R. Meier** as a sales application engineer to the Boston District Sales Office of the **Reliance Electric & Engineering Company** at 285 Columbus Ave. was announced by **E. E. Helm**, vice president in charge of sales.

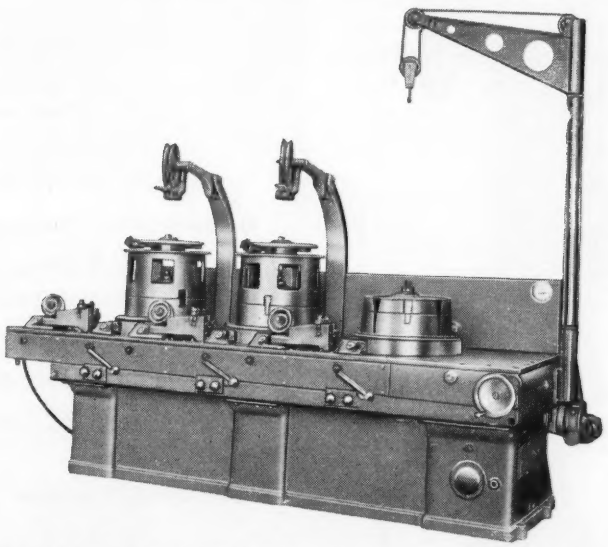
EW

Wire Drawing Machines, working on the dry or wet method (soap powder or by immersion) for iron, steel, copper, aluminum and other metal wires.

Metal Wire Cloth Weaving Looms (fly & mosquito nets, sieves, plastering work).

Automatic Straightening and Cutting Machines.

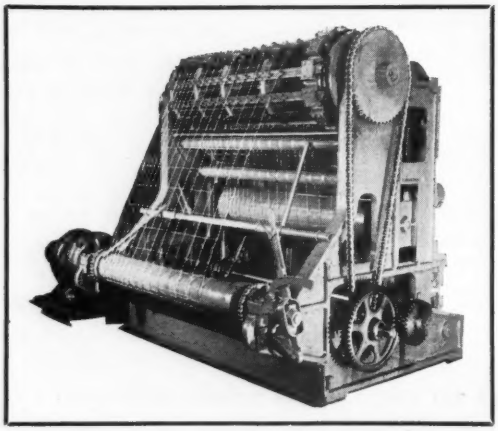
Machines for producing: Wire nails and wire tacks, rivets, iron & wood screws, small nuts, welded and non-welded chains, knotted chains, barbed wire, wire pins, safety pins, hair clips, spokes and nipples for bicycles, etc.



EMILIO WARTENWEILER

MILANO (Italy) Via G. B. Pergolesi, 18

INTERLOCKING FENCE LOOMS

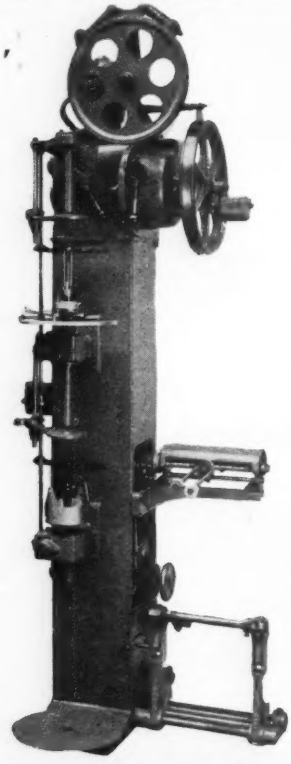


- Fastest — Most Efficient.
- Preferred by Leading Mills.
- Low Maintenance Cost.
- Wrapped Stay Fence.
- Straight Stay Wires.
- Integrated — Space Saving.
- Replaceable Main Bearings.
- Single or Double Strands.
- Years of Low Cost Production.

Write for Detailed Information — Without Obligation

Interlocking Fence Co., Dept. L, Morton, Ill.

Specialists In Fence Looms



INSULATING MACHINE IM 402

THE BEST MACHINERY FOR WIRES AND CABLES

HERE ARE OUR PRODUCTS:

- **Vertical and Horizontal Insulating Winding Machines**
  Covering wires from 38 AWG size to a 4″ diam. cable, with cotton, silk, nylon, fiberglas, paper or asbestos—for magnet wire, telephone cable, power cable, flexible cable.
- **Bunching Machines for Fine Wire**
- **Assembling Machine for up to 18 Covered Wires**
- **Hi-Speed Winding Machines**
- **Quadding and Twisting Machines**
- **Horizontal Twinners**
- **Rubber Covering Machines**
- **Cable Handling Equipment**
- **Re-Spoolers**
- **Haul-Off Capstans with Variable Drive**

POURTIER MACHINES

153, RUE GALLIENI, ROMAINVILLE (SEINE), FRANCE

New Container for Packaging Magnet Wire

A new method of packaging magnet wire has been developed. The new container, made of two identical parts of molded fibre, was developed under the sponsorship of **Anaconda Wire & Cable Co.**

★ ★ ★

Magnet wire shipment has long been a major problem to the wire and cable manufacturers. Damage the wire in even a minor way in handling and you could conceivably change the electrical characteristics of any winding or other electromagnetic device into which the wire might be incorporated. It's essential, then, that magnet wire should pass from factory to user in absolutely perfect condition. The new container apparently accomplishes just that.

★ ★ ★

The container, moreover, offers many more "benefits" to both customer and manufacturer than the old-style wooden type. It's easy to carry from point to point, and easy for shipping and receiving men to heft. (Actually the new container weighs only 1/3 the weight of the old-style box type). Because of its shape, it "packs" better as well.

★ ★ ★

It's safe; the same design characteristics built in to make it easy to handle have eliminated sharp corners, nail hazards and slivers. It's a simple, tray-like case that safely cradles the spools of magnet wire, yet makes them readily available for use. The customer needs only remove the top cover and he can then lift the lower tray to his storage shelves.

★ ★ ★

Operators selected for test uses, report extreme satisfaction with this new type of case—preferring it by far to the wooden packing cases.

★ ★ ★

Timken Appointments

R. G. Wingerter has been appointed assistant general manager and **J. R. Splitstone** has been made district manager of the **Timken Roller Bearing Company** at Canton, Ohio.

Glass Fibers Appoints Director of Research

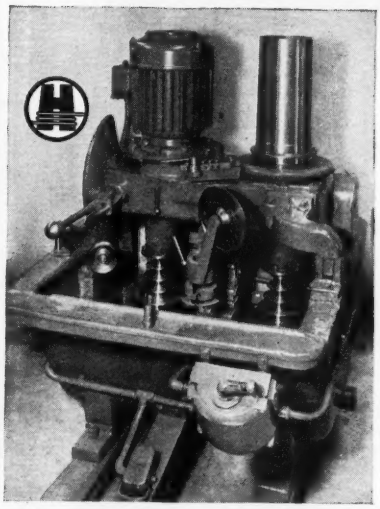
Emil H. Balz has been appointed Director of Research of **Glass Fibers Inc.**, according to an announcement made by **Randolph H. Barnard**, president.

★ ★ ★

In the past, Dr. Balz has served as both a consultant to the glass concern and had charge of the glass and plastic laminate laboratory. It was under Dr. Balz' direction that the "Vitron" continuous glass cloth treating process was developed at the Waterville, Ohio plant of the company. Glass cloth treated by the new process goes into aircraft radardomes, flat sheet electrical panel boards for the U. S. Navy, backing material for aircraft wing fuel cells and many other glass-plastic applications. Dr. Balz brings to Glass Fibers a wide experience in the field of chemistry.

HERBORN

WIRE DRAWING MACHINERY



HERBORN High-Efficiency 11-Die Wire Drawing Machine, Model TF IIIa

for the drawing of iron wires, starting size .0591", finishing .0236" or less, and of steel wires from .0473" to .0197" or less; for phosphor bronze and other hard wires from .0473". 10 hp. motor with change-speed gearbox.

FOR all metals, from wire rod to finest fractional dimensions with single and multiple draw.

Herborn High Efficiency Multiple Wire Drawing Machines are unsurpassed in efficiency and economy.

Continuous electric patenting, tempering and annealing equipment for wire, rod and strip, tinning and galvanizing installations.

The complete range of types, sizes and capacities, covered by Herborn Wire Drawing Machinery, provides the most efficient solution for your wire drawing operations.

Particulars and prices on request.

KO CO., INC. INDUSTRIAL IMPORTERS

KURT ORBAN CO., INC.

21 WEST ST., NEW YORK 6, N. Y.

4220 Prospect Avenue, Cleveland 3, Ohio

Technical Bulletin Gives Information on Descaling

Bulletin 25, issued by the **Hooker Electrochemical Company**, Niagara Falls, N. Y., describes and illustrates the process by which Virgo Descaling Salt is used in cleaning wire, rods, bars, tubes and other forms of stainless and alloy steels by the Hooker Process.

★ ★ ★

This process is a well-established one, said to be economical, simple, fast and safe. The equipment required is also indicated. While the conventional steps of salt bath immersion, quenching, acid dipping and hosing is widely used, a continuous process has been developed for certain applications. Details on the chemistry of the process is included.

★ ★ ★

For a copy of this informative bulletin, write to company at the above address.

★ ★ ★

United Steel & Wire To Make "Concertina" Wire

United Steel & Wire Company has started production on its new defense contract to make 391,211 rolls of "concertina" barbed wire for the U. S. Corps of Engineers. Lowell B. Genebach, president, said it would be several weeks before the company reaches capacity production on the contract, which will not be completed until mid-1953.

★ ★ ★

Concertina barbed wire is used by the military to make wire entanglements. Each coil will stretch out about 65 feet, and is about four feet high.

★ ★ ★

New Sprague-Herlec Trimmer Capacitors

Ceramic trimmer capacitors for use in circuit applications where maximum stability of capacitor characteristics is of utmost importance are a new product of the **Herlec Corporation** of Milwaukee, Wisconsin, a subsidiary of the Sprague Electric Company. Full details on Sprague-Herlec Type AO8 capacitors are available on business letterhead request for Engineering Bulletin 604 to either Sprague or to Herlec.

★ ★ ★

Reynolds Metals Co. Appointments

The appointment of **W. T. Ingram** as General Sales Manager of the Pacific Coast Region of **Reynolds Metals Company** was announced recently by **David P. Reynolds**, vice president, Domestic and Foreign Marketing.

★ ★ ★

W. K. Allen Ferguson, who preceded Mr. Ingram as General Sales Manager of the Pacific Coast Region, has now been appointed General Director, Pricing, General Sales Organization with headquarters in Louisville at the General Sales Office.

★ ★ ★

Also going into the Los Angeles Office, transferred from San Francisco, is **Hayden Clement**, Sales Manager of the Packaging Markets for the Pacific Coast Region. Mr. Clement has been on the West Coast since 1949.

Standardize on ACROPAK* Spools!

Only ½ the Weight!

YET STRONG, TOUGH, RIGID . . *LONGER LIFE*

ACROPAK Spools will help you cut wire packaging costs because they give longer service, require less maintenance and cost less to ship. They're strong. They'll take repeated shippings and still run true on the arbor. They're machined to close tolerances. You can run them at high production speeds with fewer snags, less toe-out and minimum end breakage. When reconditioning is finally needed, you can do it faster, easier and at less cost with special fixtures we supply.

- Light Weight
- Precision built
- Reduced cost
- Longer life
- Extra strength
- Dynamic balance
- Greater production
- Low cost reconditioning
- Less maintenance
- Attractive packaging

THEY CUT YOUR SPOOLING COSTS

Best proof of ACROPAK superior performance are the millions of these spools now used by the biggest names in the wire industry. We've proved it to them—let us prove it to YOU.

Write for information

ACROMETAL PRODUCTS INC.
Division U. S. Bobbin and Shuttle Co., 616 Fifth Street N., Minneapolis 1, Minn.

S. A. ETECO

ZWEVEGEM
(BELGIUM)

Selling Office for
Tréfileries León Bekaert,
S.P.R.L.

STEEL WIRES

IF YOU REQUIRE

NO CMP REQUIRED

Submit your
SPECIFICATIONS
To The
REPRESENTATIVES:

J. GERBER & CO., INC.
855 Avenue of Americas
NEW YORK 1, N. Y.

Electrical Developments in 1951

(*Continued from page 267*)

motors is the new Type D/A asbestos-insulated wire that offers superior flexibility and consistently higher dielectric strength with smaller insulation thickness than previously possible with any type of asbestos-insulated wire.

★ ★ ★

Control Cable

An all-silicone ignition cable that possesses excellent electrical properties even after prolonged immersions in petroleum hydrocarbons was designed and put into production in 1951. Capable of operation through a temperature range of —65 to +450 F. the cable has a stainless-steel conductor with an insulation of silicone rubber, a reinforcing-glass-fiber braid, and an overall sheath of silicone rubber.

★ ★ ★

Another development was a 30-volt low-tension cable designed for communication, lighting, and gunfire control circuits of all military vehicles and tanks. Construction consists of a flexible copper-stranded conductor, high-grade natural rubber insulation, open glass-fiber-reinforcing braid, and a low-temperature flame-retardant neoprene sheath. These cables are also resistant to petroleum hydrocarbons, as well as fungus growth, and will withstand mechanical abuse at temperatures as low as —65 F.

Other Metals

Aluminum production, stimulated primarily by aircraft requirements, is growing at a record-making pace. From 1,400,000,000 pounds per year capacity in 1949, the goal is 2,200,000,000 pounds for 1952. It takes about nine kilowatt-hours of d-c power per pound of aluminum; thus an additional demand of 800,000 kw is indicated. Since low-cost hydroelectric power is not readily available in the necessary amount, the industry has turned to natural gas to fill a part of this demand for power. More than 350,000 kw of this additional capacity was provided by gas engines driving d-c generators. Units of 1100 to 2500 kw are used. Aluminum pot lines as large as 100,000 amp at 750 volts are under construction, and it is ex-

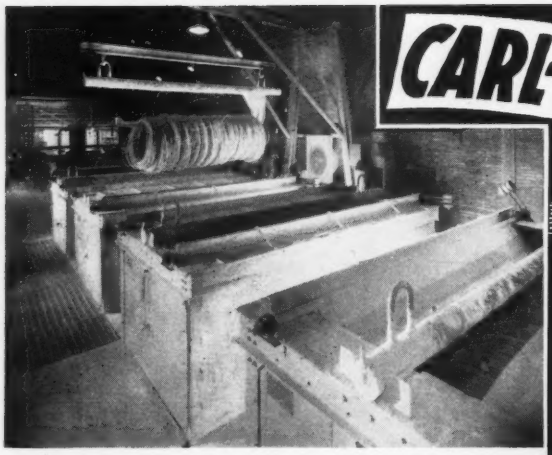
Just Common Sense . . .

It's just common sense for wire manufacturers to prefer non-returnable spools that meet specifications—and also cost less. That's why more Mason Spools are being used in the wire industry than ever before!

See for yourself how Mason Spools can help save you money. You'll find them available in standard head and barrel sizes.

Write today for samples and a quotation based on your requirements!

MASON CAN COMPANY
1949 Dexter Rd., East Providence 14, R. I.
MASON CAN COMPANY OF OHIO
Greenville, Ohio



CARL-MAYER

HI-SPEED REGISTERED

ROD BAKERS

PATENT Nos.
U.S.A.
2,235,559
2,296,361
2,323,828
CANADA
396,144
401,589

GREATER SPEED AND FUEL ECONOMY PROVES OUTSTANDING ENGINEERING

Carl-Mayer Hi-Speed Rod Bakers have an exclusive heating arrangement, combining faster baking with amazing fuel economy — and a patented Blow-Off feature which removes moisture without bumping or agitating the coils. *WRITE FOR BULLETIN NO. 350.*

ALSO OTHER TYPES OF INDUSTRIAL OVENS AND FURNACES

SERVING CONCERNS LIKE THESE:

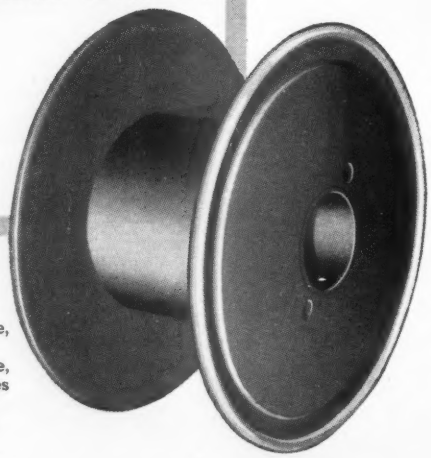
American Steel & Wire Co.
Atlantic Wire Co.
Atlas Steel Co.
Atlas Tack Corp.
Babcock & Wilcox
Canadian Steel Corporation.
California Wire Cloth Corp.
Colorado Fuel & Iron Corp.
Crucible Steel Co. of America.
Eaton Manufacturing Co.
Frost Steel & Wire Co., Ltd.
B. Greening Wire Co., Ltd.
Gary Screw & Bolt Division of Pittsburgh Screw & Bolt Corp.
Hollup Corp.
Indiana Steel & Wire Co.
Johnson & Nephew, Ltd.
Jones & Laughlin Steel Corp.
Page Steel & Wire Co.
Pittsburgh Tool Steel Wire Co.
Republic Steel Corp.
Steel Co. of Canada

THE CARL-MAYER CORPORATION

3030 EUCLID AVENUE
CLEVELAND, OHIO

What's your problem with...

SPOOLS
REELS
BOBBINS?



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pected that even before the present expansion is completed another similar one will be authorized.

★ ★ ★

Production of chemicals, such as chlorine, sodium, phosphorus, ferroalloys, and others, is steadily and rapidly growing. This creates a large demand for rectifiers for electrochemical processes and for large transformers used for electric furnaces. A 25,000-kva transformer—one of the largest units of this type ever built—has been installed on a phosphorus furnace.

UHF TV Receivers

The proposed 70 additional television channels in the ultrahigh-frequency spectrum from 470 to 890 megacycles comprise a little-used part of the radio spectrum; hence considerable engineering and research work has been necessary to determine acceptability for commercial television.

Television Transmitters

There's an entirely new approach to transmitters in the UHF band. Low-power circuits using conventional tubes in specially designed cavities generate the fundamental signal, and a velocity-modulated tube, the klystron, amplifies it nearly 100 times in a single stage. This tube's vacuum envelope contains the resonant circuits, as well as the electron source and coupling —it is essentially a self-contained amplifier. With the highest known television power so far achieved at these frequencies, it represents a major advance.

Television-broadcast Antenna

A new antenna, developed to permit maximum utilization of UHF power, consists basically of a helical rod uniformly spaced from, and coiled about, a vertical mast. Relatively unaffected by rain and ice, and noncritical in adjustment, this antenna, in four-bay form, raises by 20 times the effectiveness of the power generated at the transmitter; energy is concentrated in a disc

horizontally where it is effective for exciting television receivers rather than being wasted at high angles. The transmitter gave very acceptable service up to 20 miles.

★ ★ ★

The translator demonstrated by General Electric provides continuous tuning over the UHF band; self-contained and including its own power supply, it is designed for use with any standard-band receiver.

Electronic Tubes

Activity in the industrial and transmitting-tube field was directed to meeting present and future needs of the government for national defense and the requirements of television broadcasting in the UHF and VHF bands. Development was initiated on a new line of magnetrons and hydrogen thyratrons — tubes used widely in the military service.

★ ★ ★

A rectifier unit with new structural and control features supplies power pulses of 3000 amp at 2500 volts for a particle accelerator at the California Institute of Technology. The unit consists of six pumpless ignitron tanks with double grids connected for double-way operation. High-speed control is provided by new tube excitation and arc-suppression circuits.

★ ★ ★

A new high-power disc-seal tube for military equipment has a maximum rating of 1000 volts d-c on the plate, with a dissipation of 100 watts. The maximum rating applies at frequencies up to 2500 megacycles as against 500 for the older design.

★ ★ ★

In the commercial field, new types were developed: a water-cooled tube of ring-seal construction for VHF transmitters that requires 1100 watts less filament power than its predecessor; and a low-noise twin-triode widely heralded as reducing "snow" on the television screen in weak signal areas.

Electrical Insulation

A new clear-baking insulating varnish, G-E 9700, has exceptional through-cure characteristics, excellent bonding properties at high temperatures, and good heat-aging resistance as measured in terms of retention of flexibility.

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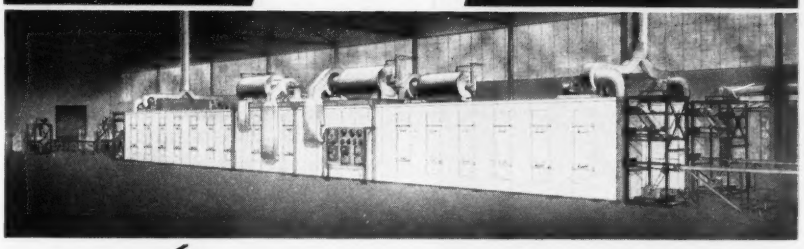

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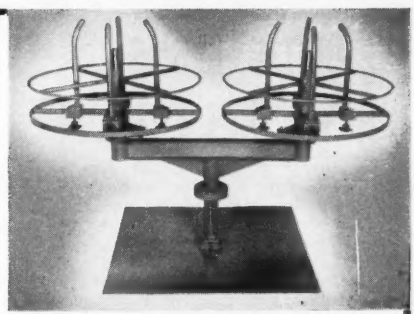

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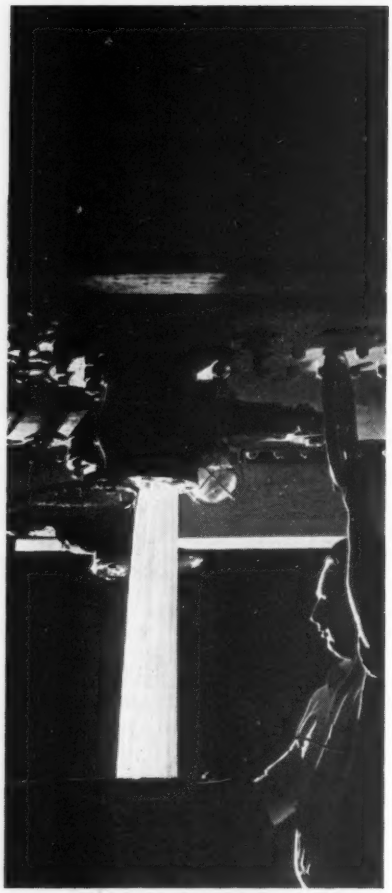

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★ ★ ★

Metal-clad laminates, with paper-phenolic cores that exhibit high insulation-resistant properties under humid conditions, were developed for use in printed circuits. Glass silicone laminates are used where such circuits are exposed to higher temperatures.

★ ★ ★

Remote-control wiring, first introduced for residential use, made great strides in commercial and industrial markets. In conjunction with the new rating of 5 amp, 277 volts for the relays, it is now practical to use remote-control wiring on 480Y/277-volt distribution systems for office lighting and other applications.

★ ★ ★

An installation at the new Columbia. SC, fire department headquarters created widespread interest. Remote control is part of an intricate electric system that allows one man at the switchboard to alert all firemen over loudspeakers located throughout the station, to turn on or off every light in and outside the firehouse, open and close the eight doors, control every one of the city's 88 traffic lights, maintain a two-way radio conversation with all apparatus, and to record all phone fire-calls coming into the station.

★ ★ ★

To aid surface mounting of remote-control relays. Monowatt Department of General Electric developed a junction box surface-wiring

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Manufacturing Industries

Machine tools — machines that make machine — became more elaborate, more specialized. Automatic contour-follower control and multiplicity of adustable drives per machine are but a few of the requirements to speed the manufacture of aircraft frames, jet engines, and other defense and civilian items.

★ ★ ★

Heavy orders in 1951 for electric furnaces for heat-treatment of manufactured articles proved the economy and high quality of this production tool.

★ ★ ★

For large printing presses a drive consisting of d-c motors backed by adjustable-voltage rectifiers gained wide acceptance. A similar drive was ordered for two sugar tandem mills.

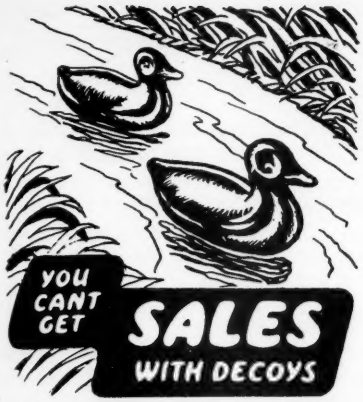
★ ★ ★

The demand for paper continues high, reflecting the growing need for containers, newsprint, and other such material for the economy. Many new high-speed sectional paper machines were installed, are under construction, and on order. Precision electronic-amplidyne speed regulators to keep the machine sections in step have become the industry's standard.

★ ★ ★

The first commercial application of ultrasonic cleaning units on a manufacturing production line was made in 1951 for Schick Inc. for use in degreasing electric shaver cutters after machining. Lapping compound and other oils are cleaned from the cutters by the use of ultrasonics more quickly and more effectively than by the use of cleaning solvents alone.

★ ★ ★



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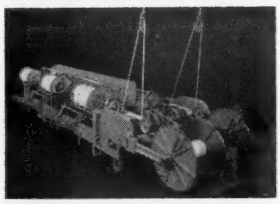

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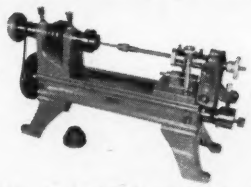

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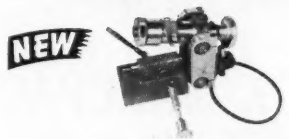

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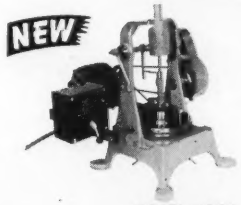

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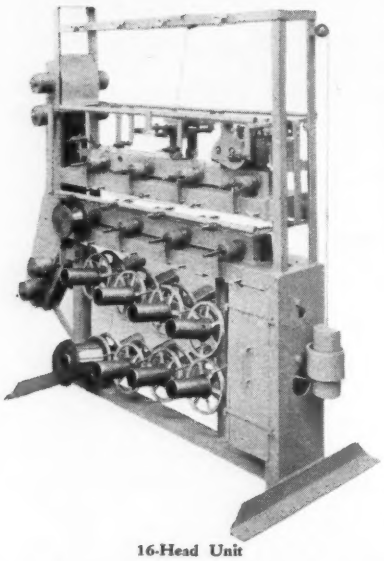

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Beryllium Copper Wire — Property and Design Considerations

(*Continued from page* 262)

these are reproduced in Table X. As indicated in this table, beryllium copper wire compares favorably with pure copper.

Design Considerations

The engineering properties of beryllium copper shown herein result from tests conducted under inspection or laboratory procedures, so that some care should be exercised in attempting to incorporate these values in design work. Safe working stresses depend not only on the material used, but also on type of load (static or endurance) and operating conditions. In addition design stresses derived from engineering properties should be used only where the part can be readily subjected to stress analysis.

★ ★ ★

For static loads, the stress will be limited by the amount of offset (deviation) or permanent set allowable—never by the ultimate strength. In elastic components, such as springs, the elastic limit is frequently cited as the maximum operating stress. Since this value is difficult to determine experimentally, the proportional limit or yield strength at small offsets may offer more convenient working stresses. When space permits, a maximum design stress at least 10,000 psi below the proportional limit is recommended to insure positive action in staticially loaded parts.

★ ★ ★

In the case of endurance loads, however, it is necessary to reduce design stresses to prevent failure from fatigue. Unlike many strain hardening materials, such as music wire or stainless steel, decreases in wire size do not cause appreciable increases in strength. For dynamic loading, however, the wire size should be considered, since the fatigue strength of beryllium copper wire is greater for small diameters. Other factors that should be taken into account include: number of cycles, operating temperature, corrosion and stress range. Under normal operating conditions, working stresses for heat treated wire in tension or bending may run to 100,000

psi for static loads or 50,000 psi for dynamic, while in torsion values of 70,000 psi (static) and 35,000 psi (dynamic) can be employed. For pretempered wire, these figures should be reduced approximately 15 per cent. Design stress data for beryllium copper wire in the heat treated condition has also recently been presented by Meyers (19).

★ ★ ★

For springs and similar elements, adequate allowance must be made for forms that introduce higher stresses than shown by formula. High localized stresses can be caused by bends, brazed or soldered areas, hooks on extension springs, etc. Even when working stresses are within prescribed limits and ample allowance has been made for yield or fatigue, small deviations from elastic laws can be observed, as pointed out above in considering anelasticity. Furthermore, safe stresses at room temperature may be found to exceed the elastic limit at moderately elevated temperatures, particularly over prolonged periods. In general, a design formula should be used only as a guide, to be supplemented by actual tests.

★ ★ ★

In using beryllium copper in place of some other material, it is generally not advisable to make a direct substitution. For example, in the usual deflection formula for round-wire helical springs:

$$F = \frac{8PD^3N}{Gd^4}, \text{ where}$$

F = deflection in inches
P = load in pounds
D = mean coil diameter in inches
N = number of active turns
G = torsional modulus in psi
d = wire diameter in inches,

the desired deflection for a given load or pressure depends upon the number of turns, coil diameter and wire diameter. Consequently to allow for the varying torsional modulus of different spring materials, it may be necessary to alter the number of turns, coil diameter or wire diameter (20). When a satisfactory design has been established, the maximum stress should be checked by the following formula:

$$S = \frac{2.55PD}{d^3}$$

If the stress determined from a given

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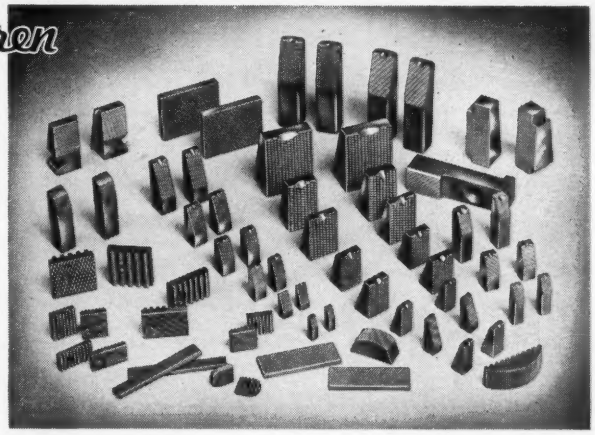

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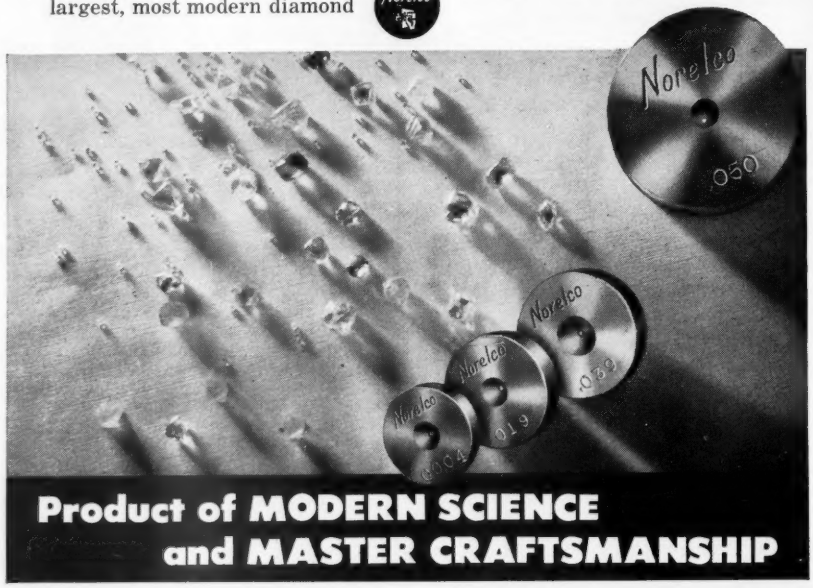

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load exceeds the allowable value for the service intended, it then becomes necessary to increase the wire diameter or decrease the coil diameter.

★ ★ ★

Similar design changes may be required in other applications. For maximum efficiency and performance, each component should be analyzed and modified, if necessary. Consequently, to utilize fully the properties available in beryllium copper, parts should be redesigned to allow for changes in modulus, working stress and conductivity.

Acknowledgment

The author acknowledges the assistance of Little Falls Alloys, Inc., in providing small diameter wire, Tinius Olsen Testing Machine Co. in conducting direct torsion tests, Hunter Spring Co. in carrying out rotating-beam fatigue tests, and Instrument Specialties Co., Inc. in supplying compression springs for thermoelastic determinations.

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★ ★ ★

Norton Introduces New Grinding Wheel

Norton Company has announced a new reinforced, flexible, hub-type grinding wheel known as the Norton BFR wheel. ("B"—standard marking for resinoid, "F"—fibre construction, "R"—reinforced). With the BFR, an operator can now rough grind, finish grind, and notch—all with the same wheel.

★ ★ ★

Designed for use on "right angle" or "sander" type portable grinders, this wheel is made of carded web material impregnated with abrasive grain. It is light, possesses unusual strength due to patented construction, is sufficiently flexible to permit blending of contours, and does a good polishing job.

★ ★ ★

Generally, the new BFR wheel will be used to smooth down welds, blend surfaces on contours, and notch risers in all kinds of castings.

★ ★ ★

New! IMPROVED LOW COST FLASH BAKER

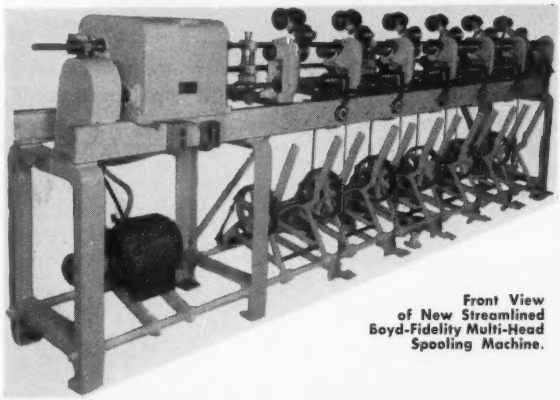
Mr. John R. Morrison, who originated and has built most of the Flash Bakers now in use, announces a new, improved, low cost Baker with these important features:

MORE COMPACT—requires only small pit below floor level.
FASTER BAKING—due to increased air velocity and reduction in waste space in baking chamber.
LESS MAINTENANCE—new ram-jet type burner equipment replaces old style brick combustion chamber with its inherent, troublesome failures.
GAS OR OIL FIRED—use either fuel instantly.
SHIPPED COMPLETELY ASSEMBLED—low installation costs.
All of which add up to a more efficient Flash Baker—at low cost.

Write for complete specifications.

MORRISON INDUSTRIES, INC.
engineers & builders of industrial process equipment
furnaces • ovens • dryers • washers • pickling and plating machines • material handling systems • wire mill equipment • special production equipment
17700 BROADWAY • BEDFORD, OHIO

A New and Improved . . . .
MULTI-HEAD SPOOLER



Front View of New Streamlined Boyd-Fidelity Multi-Head Spooling Machine.

This six-head spooler has a common traverse for all spindles. Each spindle is started independently by manual control and stopped automatically by a predetermined footage counter through a solonoid released clutch. The rate of traverse for different wire sizes is governed by easily changed gears. All parts precision made.

Will wind wire on spools up to 10" in diam. and traverse of ½" to 8". Furnished also to wind on wider spools, if desired, and with one to twelve spindles. Counter stop-motion, wire compensators and wire straighteners are optional equipment. Anti-friction bearings. Spindle speeds up to 1200 f.p.m. possible.

Send for full details.

BOYD & SONS MANUFACTURING CORPORATION
1434-38 Callowhill St., Philadelphia 30, Pa.

Vapor - from - Paper
STOPS RUST

Now wire is being protected in storage and in shipment without oil or grease. VPI vapor permeates area within carton. Makes air and moisture harmless to shiny wire surfaces. For "VPI Facts", write: Angier Corporation, Framingham 3, Mass.

ANGIER VPI* WRAP

*Reg. U.S. Pat. Off.
Vapor Rust Preventive

New Catalog Published by U. S. Rubber

A new 52-page engineering catalog on its line of electrical wires and cables for the coal mining industry has been published by the electrical wire and cable department of **United States Rubber Company.**

★ ★ ★

The booklet includes complete performance and specification data on insulation and jacket compounds, portable cords and cables with a voltage rating up to 5,000 volts. Also included are complete data on shielded portable cables, welding cables, bore hole cables, mine power cables and miscellaneous mine equipment such as blasting wires, miner's lamp cord and mine telephone cable.

★ ★ ★

Engineering data on splicing and patching, current carrying capacities, conductor resistance temperature correction factors and formulae for determining amperes are also incorporated in the booklet.

★ ★ ★

Copies of the catalog may be obtained from **R. H. Turner,** electrical wire and cable department, United States Rubber Company, Rockefeller Center, New York 20, N. Y.

★ ★ ★

Pennsalt Announces Metal Processing Dept.

The Pennsylvania Salt Manufacturing Company announces the consolidation of all sales and service in chemical specialties for metal cleaning, fabricating and processing in one sales department named the Metal Processing Department.

★ ★ ★

The department, headed by **J. J. Duffy, Jr.,** sales manager, represents a merger of two groups which have heretofore functioned independently of one another within the company; namely, the Industrial Metal Cleaners Department and the Fos Products Department.

★ ★ ★

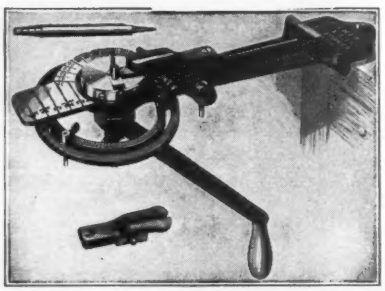
It was in the mid-thirties that the company began supplying chemical specialties to the metal industry with the introduction of a limited number of products for metal cleaning. This undertaking, which has since assumed departmental status, has steadily increased to include more than 30 alkaline cleaners, inhibited acid cleaners and emulsion cleaners.

★ ★ ★

The Fos Products Department was organized to function independently only a year ago. Its growth has been rapid, however, and today its sales and service activities include a number of Fos Process installations throughout the steel industry. The process, which consists of compatible cleaning, pickling, phosphatizing and lubrication, has proven highly successful in cold extrusion of steel, tube drawing, wire drawing and ordnance industries.

★ ★ ★

KILMER WIRE FORMER



- Forms Eleven Sizes of Eyes from Flat, Round, Square or Half - Round Stock, also Almost Any Shape Desired
- **Adjustable for No. 3 to No. 21 Gage Wire**

The cut on right shows a few of the thousands of the forms made on this **WIRE FORMER**

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METAL BOUND RETURNABLE REELS

Made in 12" to 24" diameters.

No nails used. *All glued construction.* Made of kiln-dried wood. Special design prevents breaking or splintering of wood, protecting insulated wire from damage.

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OUR 1952
WIRE & WIRE PRODUCTS
DIRECTORY
WILL BE OFF THE PRESS
APRIL 1st

New Type Cutter Developed for Rods, Wire and Rope

(*Continued from page* 265)

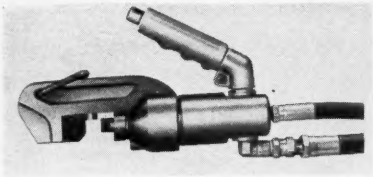

Fig. 3—Basic Guillotine unit—Series 200.

200-A and the new mill-type bolt cutter.

★ ★ ★

The 200-E unit weighs less than ten pounds, with push button valve control, and is designed to replace older types of bolt cutters on production cutting operations for wire up to ½ inch diameter. The head assembly couples to the same pump unit used with the heavier 20-E and makes a capacity cut in about ¼ second.

★ ★ ★

The 200-A is an ingeniously designed hydraulic bolt cutter weighing only 12 lbs., with ½ inch rod capacity. Performance is far superior to the standard, compound leverage bolt cutter in size, weight and cutting effort. The 42″ bolt cutter weighs 18 lbs., and requires up to a 150 lb. effort compared to the 50 lbs. needed by the new hydraulic cutter.

★ ★ ★

The new mill-type bolt cutter, designed especially for wire mills, is available in the 30″ — ⅜″ capacity size. Unusual features of the tool include, drop forged handles that won't break and reversible cutting jaws with two cutting edges that double jaw life.

★ ★ ★

Catalog On Wire Rope Assemblies

New catalog lists wire rope assemblies for machine parts and operating devices.

★ ★ ★

Called, "Macwhyte Safe-Lock Industrial Standards Wire Rope Assemblies", this new catalog illustrates and gives detailed specifications for wire rope with fittings permanently attached.

★ ★ ★

Assemblies are used, for operafing

COLD HEADING DIES
FOR HEAVY PRODUCTION SCHEDULES IN THE MANUFACTURE OF
BOLTS, NUTS, RIVETS AND SCREWS

To secure accurate cold-headed products, use EASTERN CARBIDE'S cold-heading dies and carbide quills and cut-off knives. A complete line of carbide tooling for the cold-heading industry.

Also, a full line of Tungsten Carbide wire drawing dies.

Let us tell you about these "superior performance" carbides.

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Buy the Best: MONTGOMERY
SILVER-COATED COPPER WIRE
Hard or Annealed—on spools.
Suitable for: Hookup Wire—Radio Frequency Cables—Circuit and High Temperature Wires—as specified by the Armed Services—and others.
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High and Low Carbon Steel Wire
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5 PIN-MAKING MACHINES
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All Machines Reconditioned in Our Own Shop
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BRIGHT MUSIC WIRE

Manufactured by experienced wire specialists in our plant from the highest quality Swedish music stock. Sizes from .020" to .006" —Tolerances maintained to .0001"—Guaranteed production schedules.

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ALL SIZES
WOOD-PLYWOOD-WOOD-METAL
RETURNABLE NON-RETURNABLE
Samples and Prices on Request
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MUSIC WIRE and SPECIAL WIRES
Music Wire for Industrial Purposes
In Over 100 Sizes, Polished and Tinned, from .0015" to .359" in dia.
Aluminum — Annealed — Belt Lacing — Brass, Soft and Spring — Copper, Bare and Tinned Coppered Steel Spring — Galvanized — Tinned
Monel — Nickel Silver — Pure Soft Nickel — Oil tempered, Steel Spring, Black Finish Phosphor Bronze, Spring Temper — Picture Wire — Iron Wire, Pure — Resistance Wire, Hoskins Chromel "A" — Stainless, Soft and Spring Temper — Tag Wire, 1000 in an Envelope — Florist Wire — Spooled and Coiled, ¼-½-1-5#
Wires Straightened and Cut to length — Small Gauges — Small orders our specialty
Wires and Strands for the fishermen. Trolling Wires, Copper-Monel-Stainless.
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controls, as a part of machinery and equipment, and for slings and hoists.

★ ★ ★

Copy of catalog is available by asking for catalog Industrial Standards #5201 from Macwhyte Company, Kenosha, Wisconsin.

★ ★ ★

Bulletin Describes Reel Boers

A bulletin issued by the **B. M. Root Company,** York, Pa., under the caption "Boring Cable Reels the Modern Way," describes the cable reel boring machine made by the company, giving plans of various reel heads with a variety of hole arrangements that can be bored on the machines. Copies of this bulletin will be mailed to those who ask for it.

★ ★ ★

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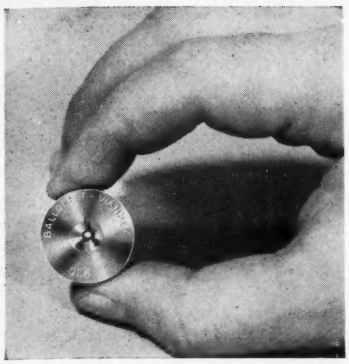

All sizes from .081" down to .0004" in stock from New York.

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Any Wire Drawing
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CALENDAR OF COMING EVENTS

Pittsburgh Regional Meeting

at the William Penn Hotel, May 8 & 9, 1952. The detailed program is printed on page 263 of this issue. You won't want to miss this meeting. The technical sessions, the two plant visits and the banquet will all be well worth your while.

●

Los Angeles Regional Meeting

The meeting on the Pacific Coast will be held Friday, June 13th. Plant trip through plant of K. H. Davis Wire & Cable Corporation in afternoon. Banquet at 7 p.m. followed by technical session in the evening.

●

The Annual Convention

This will be held in Cleveland this year, November 10-14, with headquarters at the Carter Hotel. Please note the change from October to November. Full details to be announced later.

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Richard South Joins Atlas Mineral Products Company

President, George L. Wirtz, has announced that **Richard South,** formerly an expeditor for the Belden Brick Company, Canton, Ohio, has joined the **Atlas Mineral Products Company's** Sales Department and will be assigned to a territory in Southern Ohio, West Virginia and Kentucky on the sale of corrosion resistant materials and related products.

★ ★ ★

TOOLS TALIDE DIES
WEAR PARTS
Talide Metal, the super hard tungsten carbide gives increased production, better finish, less down time and scrap on all wire mill operations.
METAL CARBIDES CORPORATION
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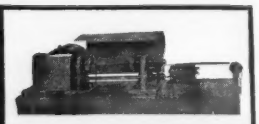
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VAUGHN No. 8 & No. 10 MOTORBLOCS.
WATERBURY ¼", ⅜", ½", ⅝" and 1" capacity Bull Blocks.
WATERBURY #0, #1 & #2 Continuous Wire Drawing Machines.
NATIONAL, WATERBURY, MANVILLE Cold Headers & Thread Rollers 1/16" to 1.
NILSON & BAIRD FOUR SLIDE MACHINES Nos. 00, 0, 1, 2, 3, 4, 3-20, 4-26.
Standard 5" x 8" & 8" x 8" Cold Rolling Mills.
TORRINGTON 9-DIE CONTINUOUS ROD Bench.
MORGAN-CONNOR 5-DIE Continuous Wire Drawing Rod Bench.
SLEEPER & HARTLEY UNIVERSAL COILERS NOS. 1, 2, 3, 3½, 4 & 5.
LEWIS-SHUSTER-HALLDEN Automatic Wire Straightening & Cutting Machines 1/16" to ⅝" (Some with Flying Shear).
National No. 2, 3, & 4 Nail Machines.
Our Stock is Always Changing and We Invite Your Inquiries
NATIONAL MACHINERY EXCHANGE
130 MOTT ST. NEW YORK, N. Y.

U. S. Rubber to Expand Plastic Facilities on Coast

A major expansion of facilities for the manufacture and sale of rubber latex and plastic materials on the West Coast, was announced in February by **Naugatuck Chemical Division, United States Rubber Company.**

★ ★ ★

A new plant has been completed on Telegraph Road, Los Angeles, Calif., which will be the division's western sales headquarters. The plant will also contain customer technical service laboratories, facilities for the compounding and storage of natural and synthetic rubber latex, and facilities for warehousing resins, plasticizers, rubber chemicals, agricultural chemicals and other products in the Naugatuck Chemical line.

★ ★ ★

Naugatuck Chemical first set up a plant on the West Coast in 1946. The new plant will enable the division to keep pace with its rapidly expanding volume of West Coast sales.

★ ★ ★

Schedule Spring Diffraction School

North American Philips Company, Inc. will hold its twelfth X-ray Diffraction School at the company's plant, 750 South Fulton Avenue, Mount Vernon, N. Y. during the week beginning Monday, April 21 through Friday, April 25.

★ ★ ★

Exact program details will be announced later but basic subjects to be covered by prominent educators and scientists will include X-ray diffraction, new high and low temperature camera techniques, fluorescence analysis, Geiger-counter X-ray spectrometer, and electron microscopy and electron diffraction.

★ ★ ★

The sessions involve extensive classroom and laboratory work and ample opportunity is provided for participants to discuss their own problems and to become familiar with actual use of all types of equipment.

★ ★ ★

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Send data on Engineering & Construction facilities for ACID-ALKALI-PROOF CONSTRUCTION of pickling and other tanks; flooring.
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JIG BORING . . . SPOT WELDING . . . CONTRACT PRODUCTION . . . EXPERIMENTAL DEVELOPMENT
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WATER PROOF and CREPE PAPER in rolls of any size for wrapping coils and reels.
CREPE-KRAFT BARREL LINERS
THE CREPE-KRAFT COMPANY
Division of National Waterproof Papers Inc.
Camden, N. J.

Wire Measuring...
PRODUCTIMETERS
Send for Catalog No. 40
Precision-built for accuracy and speed. Most complete line offered
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WORLD'S LARGEST MANUFACTURER
SPIRAL WRAPPING MACHINES
For Coils or Straight Lengths
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Philips initiated these semi-annual diffraction schools in the fall of 1946 in order to acquaint scientists and industrialists with the latest techniques for use of this new and powerful X-ray analysis tool. For several years, the available accommodations for the Philips Diffraction Schools have been outnumbered by last minute applications. Those who are interested should register with the company as soon as possible.

★ ★ ★

'Surface' HEAT TREATING FURNACES
For Ferrous and Non-Ferrous Wire.
Prepared Atmosphere Generators.
SURFACE COMBUSTION CORPORATION
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Wire Flattening Mills.
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STEEL EQUIPMENT CO.
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Division of
THE CLEVELAND CRANE & ENGINEERING CO.
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WIRE and PROCESS MACHINERY
Custom Machinery Engineered
to Suit Requirements of User.
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ALL TYPES—ALL SIZES
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Specify CARBALT PLASTIC
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ERIE IRON & SUPPLY CORPORATION
2002 Warfel Ave. • Erie, Penna.
Phones 4-7139, 2-2503

The Manufacture and Use of Fourdrinier Wire Cloth

(*Continued from page* 254)

Misuse of mercury containing slimicides or certain conditions of high chlorides in the water supply have been linked with this phenomenon. Production of some specialty papers, such as wet strength, can result in an environment that is very detrimental to the wire. Fortunately, for the wire manufacturer at least, a corrosion problem with wires is usually accompanied by corrosion problems with other pieces of paper mill equipment. Therefore paper mills, machine builders, and others have become aware of the conditions. One or two paper mills have gone so far as to hire a corrosion engineer to devote his full time to a study of corrosion problems, wires included. Wire manufacturers are most anxious to cooperate with these men so that information that is of mutual advantage can be pooled and occasional duplication of effort might be avoided.

★ ★ ★

It is only natural that after putting all the effort, care, accuracy, and research into the production of a Fourdrinier wire; the manufacturer retains his interest in the product until he is sure that is has run out a good life. His objectives are completed only after the wire has been relegated to the scrap pile, having performed to the complete satisfaction of the paper machine operators.

★ ★ ★

YOU ARE CORDIALLY INVITED TO JOIN THE WIRE ASSOCIATION and participate in its activities. In becoming a member, you help yourself and others to advance the interests of our great industry.

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FOR YOUR SPOOLS AND REELS
Patented all-steel electro-welded Drawing and Annealing and patented metal-bound shipping spools and reels.
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WIRE DRAWING MACHINERY AND EQUIPMENT
Rod Frames — 16" Frames, 8" Frames — Take-Up Frame, Wire — Pointers — Puller Tongs. — General and heat resisting alloy castings for wire mill use.
Circulars on Request.
E. J. SCUDDER FOUNDRY & MACHINE CO.
TRENTON, N. J.

Aluminum Industry Expanding to Meet National Defense Program

The first expansion unit of Texas' booming aluminum industry recently began operating to meet the growing needs of America's national defense program.

★ ★ ★

With the flick of a switch, **George R. Stout,** manager of the Point Comfort Works of **Aluminum Company of America** near here, set the first of two new smelting lines into operation at the plant.

★ ★ ★

The new line increases Point Comfort's production capacity to about 135,000,000 pounds of aluminum annually, and constitutes a major step toward alleviating the national aluminum shortage.

★ ★ ★

By terms of a contract signed last fall by Alcoat and the General Services Administration, the U. S. Government will get first call for five years on the output of the two new Point Comfort units.

★ ★ ★

The second new line is scheduled for completion within three months.

★ ★ ★

Two new aluminum smelting plants are also under construction by Alcoa. One of these is being built at Wenatchee, Washington. The other one is now under construction at Rockdale, Texas.

★ ★ ★

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Preliminary Announcement of the

PACIFIC COAST REGIONAL MEETING
of the
WIRE ASSOCIATION

June 13, 1952, Hotel Biltmore, Los Angeles, Cal.

A plant inspection trip will be made in the afternoon to the K. H. Davis Wire & Cable Corporation mills.

After returning to the hotel, cocktails will be served at 6 P.M. and the annual banquet will start at 7 P.M. Following the banquet a technical session will be held with two papers. One will be on mechanical descaling of rods, an operation that it is hoped will be functioning in the plant during the plant visit. The second paper will be announced later.

K. H. Davis, Chairman of the Board of the K. H. Davis Wire & Cable Corp., is the program chairman and Earl K. Potter, Vice Pres., Industrial Wire Products Co., will preside over the technical session.

A GOOD MEETING. PLAN NOW TO ATTEND.

THE WIRE ASSOCIATION
RICHARD E. BROWN, Executive Secretary
453 MAIN STREET STAMFORD, CONN.

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WHERE TO BUY

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ABRASIVES—
Elgin National Watch Co., Abrasives Division, Elgin, Ill.
Norton Co., Worcester, Mass.

ACID INHIBITORS—
(See Inhibitors, Pickling)

ACID-PROOF CONSTRUCTION—
Ceilcote Company, Cleveland, Ohio
Chemsteel Construction Co., Pittsburgh, Pa.
Heil Process Equipment Corp., Cleveland, Ohio.

ANNEALING MACHINES—Open Flame
Syncro Machine Co., Perth Amboy, N. J.

ANNEALING POTS AND BOXES—
Scudder, E. J. Foundry & Mach. Co., Trenton, N.J.

ARMORING EQUIPMENT—
American Insulating Machy. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R.I.

BAKERS—Rod and Wire
Carl-Mayer Corp., The, Cleveland, Ohio
Morgan Construction Co., Worcester, Mass.

BAR STOCK—Stainless Steel
American Steel & Wire Company, Cleveland, Chicago, New York
U. S. Steel Company, New York, N. Y.

BOBBINS—Braider & Wire Weaving
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Standard Mill Supply Co., Pawtucket, R. I.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R.I.

BORAX—Wire Drawing
Pacific Coast Borax Co., New York, N. Y.

BORON CARBIDE—
Norton Co., Worcester, Mass.

BRAKES—Pneumatic
Entwistle, Jas. L. Co., Providence, R. I.

CABLE LACQUERING OVENS—
Industrial Ovens, Inc., Cleveland, O.

CARRIERS—Braider, High Speed
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R.I.

CASTINGS—Wire Mill
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.

CEMENTS—Acid Proof
Ceilcote Company, Cleveland, Ohio

CEMENTS—Refractory
Norton Co., Worcester, Mass.

CHEMICALS—Cleaning
(See Cleaners—Metal)

CLEANERS—Metal
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Phila., Pa.
Haas Miller Corp., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Metal & Thermit Corp., New York, N. Y.
Parkin Chemical Company, The, Pittsburgh, Pa.
Standard Industrial Compounds Co., Chicago, Ill.

CLEANING & PICKLING EQUIP.—
Ceilcote Company, Cleveland, Ohio
Chemsteel Construction Co., Pittsburgh, Pa.
Cleveland Tramrail Div., of the Cleveland Crane & Engineering Co., Wickliffe, O.
Heil Process Equipment Corp., Cleveland, Ohio
Holden, A. F., Company, The, Detroit, Mich.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio
Wilson, Lee, Engr. Co., Cleveland, Ohio

CLOTH—WIRE, All Metals
Roebling's, John A. Sons, Co., Trenton, N. J.
Wickwire Bros., Cortland, N. Y.

COATING COMPOUNDS—
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Pennsylvania Salt Mfg. Co., Philadelphia, Pa.
Standard Industrial Compounds Co., Chicago, Ill.
Trembicki Co., The, Chicago, Ill.

COILERS—Sheet, Strip and Wire
Entwistle, Jas. L. Co., Providence, R. I.
Morgan Construction Co., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, O.

COLD HEADERS—
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

COMPOUNDS—Coppering
American Chemical Paint Co., Ambler, Pa.

COMPOUNDS—Diamond
Eastern Carbide Corp., New Rochelle, N. Y.
Elgin National Watch Co., Abrasives Division, Elgin, Ill.
Hyprez Div., Engis Equipment Co., Chicago, Ill.
Magnus Chemical Co., Garwood, N. J.

COMPOUNDS—For Improving Drawing and Extrusion
American Chemical Paint Co., Ambler, Pa.

COMPOUNDS—Metal Finishing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Metal & Thermit Corp., New York, N. Y.

COMPOUNDS—Phosphate Coating
American Chemical Paint Co., Ambler, Pa.
Pennsylvania Salt Mfg. Co., Philadelphia, Pa.
Trembicki Co., The, Chicago, Ill.

COMPOUNDS—Rust Preventing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.

COMPOUNDS—Rust Removing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Standard Industrial Compounds Co., Chicago, Ill.

COMPOUNDS—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Bick, Hans C., Inc., Reading, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H. Co., Inc., Homer, N. Y.
Nopco Chemical Co., Harrison, N. J.
Pacific Coast Borax Co., New York, N. Y.
Pennsylvania Salt Mfg. Co., Philadelphia, Pa.
Standard Industrial Compounds Co., Chicago, Ill.
Swift & Company, Chicago, Ill.
Trembicki Co., The, Chicago, Ill.

CONDUCTORS—Flexible, Electrical
Montgomery Co., The, Windsor Locks, Conn.

COPHOLDERS—Steel
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R.I.

CORDS—Electrical, Tinsel Conductor
Montgomery Co., The, Windsor Locks, Conn.

CORROSION PREVENTIVE PAPERS—
Angier Corporation, The, Framingham, Mass.

CRANES—Wire Mill
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

CUTTING TOOLS—Carbide
Carboloy Dept. of General Electric Co., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling Steel & Carbide Corp., Pittsburgh, Pa.
Metal Carbides Corporation, Youngstown, Ohio
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.

DIAMONDS—Industrial
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIAMOND POWDERS—
Danforth, The C. W. Co., Youngstown, Ohio
Eastern Carbide Corp., New Rochelle, N. Y.
Elgin National Watch Co., Abrasives Division, Elgin, Ill.
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Hyprez Div., Engis Equipment Co., Chicago, Ill.
Indiana Wire Die Co., Ft. Wayne, Ind.
National Research Company, St. Claire Shores, Mich.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIAMOND POWDER RECLAIMING—
Danforth, The C. W. Co., Youngstown, Ohio
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
National Research Co., St. Claire Shores, Mich.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.

DIAMOND TOOLS—
Carboloy Dept. of General Electric Co., Detroit Mich.
Indiana Wire Die Co., Ft. Wayne, Ind.
Metal Carbides Corporation, Youngstown, Ohio
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIES—Carbide
(See Dies—Tungsten Carbide)

DIES—Cold Heading
Carboloy Dept. of General Electric Co., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling Steel & Carbide Corp., Pittsburgh, Pa.
Indiana Wire Die Co., Ft. Wayne, Ind.
Metal Carbides Corporation, Youngstown, Ohio.
Vascoloy-Ramet Corp., No. Chicago, Ill.

DIES—Diamond
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J., New York, N. Y.
Cochaud Wire Die Corp., New York, N. Y.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Indiana Wire Die Co., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
New England Wire Die Co., Worcester, Mass.
North American Philips Co., Inc., New York, N.Y.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIES—Extrusion
Carboloy Dept. of General Electric Co., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling Steel & Carbide Corp., Pittsburgh, Pa.
Metal Carbides Corporation, Youngstown, Ohio.
Murex, Ltd., Rainham, England.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIES—Eyelet
Eastern Carbide Corp., New Rochelle, N. Y.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.

DIES—Pointing
Sjogren Tool and Machine Co., Auburn, Mass.

DIES—Repairs & Re-Cutting
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J., New York, N. Y.
Carboloy Dept. of General Electric Co., Detroit, Mich.
Cochaud Wire Die Corp., New York, N. Y.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling Steel & Carbide Corp., Pittsburgh, Pa.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Indiana Wire Die Co., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corporation, Youngstown, Ohio.
New England Wire Die Co., Worcester, Mass.
North American Philips Co., Inc., Allied Products Division, New York, N. Y.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Wayne Wire Die Co., Hillside, N. J.

DIES—Special Shapes, Etc.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling Steel & Carbide Corp., Pittsburgh, Pa.
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Indiana Wire Die Co., Ft. Wayne, Ind.
Murex, Ltd., Rainham, England.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.

DIES—Swaging
Murex, Ltd., Rainham, England
Sjogren Tool and Mach. Co., Inc., Auburn, Mass.

WHERE TO BUY, Continued

DIES—Tantalum Carbide
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Carboloy Dept. of General Electric Co., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling Steel & Carbide Corp., Pittsburgh, Pa.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corporation, Youngstown, Ohio
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.

DIES—Tube Drawing
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Carboloy Dept. of General Electric Co., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling Steel & Carbide Corp., Pittsburgh, Pa.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Murex, Ltd., Rainham, England.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.

DIES—Tungsten Carbide
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Carboloy Dept. of General Electric Co., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling Steel & Carbide Corp., Pittsburgh, Pa.
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Murex, Ltd., Rainham, England.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Wayne Wire Die Co., Hillside, N. J.

DRAW BENCHES—
(See MACHINERY—Draw Benches)

DRUMS & TRAVERSES—Flange Steel
Entwistle, Jas. L. Co., Providence, R. I.
Hubbard Spool Company, Garrett, Indiana
Niles Steel Products Division, Republic Steel Corporation, Niles, Ohio

DRUMS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.
Watson Machine Co., The, Paterson, N. J.

DRYING EQUIPMENT—
Carl-Mayer Corp., The, Cleveland, Ohio
Industrial Ovens, Inc., Cleveland, Ohio
Rockwell, W. S. Co., Fairfield, Conn.

ENGINEERS—Consulting
Copper—Leonard D. Walde, North Plainfield, N. J.
Metal Fatigue—Fatigue of Materials Laboratory, Princeton, N. J.
Wire Mill—Lewis, Kenneth B., Worcester, Mass.
Zinc—Imhoff, Wallace G., Co., No. Highlands, C lif.

EQUIPMENT—Insulation Testing
Davis Elec. Co., Wallingford, Conn.
Entwistle, Jas. L. Co., Providence, R. I.

EYELETS—Brass or Zinc
Platt Bros. & Co., The, Waterbury, Conn.

FENCING & FENCES—Wire
Interlocking Fence Co., Morton, Ill.

FLUXES—Soldering
American Chemical Paint Co., Ambler, Pa.

FOAM PRODUCING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Parkin Chemical Company, The, Pittsburgh, Pa.

FRICTION PAY-OFF STANDS—
Industrial Ovens, Inc., Cleveland, Ohio.

FURNACES—Annealing
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Holden, A. F., Co., The, Detroit, Mich.
Morrison Industries, Bedford, Ohio.
Rockwell, W. S. Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engr. Co., Cleveland, Ohio.
Westinghouse Electric Corp., Industrial Heating Div., Meadville, Pa.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Automatic
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Brazing
Electric Furnace Co., Salem, Ohio.
Harper Electric Furnace Corp., Buffalo, N. Y.
Rockwell, W. S. Co., Fairfield, Conn.

FURNACES—Bright Annealing
Electric Furnace Co., Salem, Ohio.
Harper Electric Furnace Corp., Buffalo, N. Y.
Morrison Industries, Bedford, Ohio.
Rockwell, W. S. Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.
Westinghouse Electric Corp., Industrial Heating Div., Meadville, Pa.

FURNACES—Electric
Electric Furnace Co., Salem, Ohio.
Harper Electric Furnace Corp., Buffalo, N. Y.
Rockwell, W. S. Co., Fairfield, Conn.
Trauwood Engineering Co., The, Cleveland, Ohio.
Westinghouse Electric Corp., Industrial Heating Div., Meadville, Pa.

FURNACES—Galvanizing Equipment
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio.
Holden, A. F., Co., The, Detroit, Mich.
Rockwell, W. S. Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engineering Co., The, Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Hard'ing & Temp'ing
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio.
Harper Electric Furnace Corp., Buffalo, N. Y.
Holden, A. F., Co., The, Detroit, Mich.
Rockwell, W. S. Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engineering Co., The, Cleveland, Ohio.

FURNACES—Lead Melting
Electric Furnace Co., Salem, Ohio.
Rockwell, W. S. Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Non-Oxidizing
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio.
Holden, A. F., Co., The, Detroit, Mich.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Normalizing
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Clevel nd, Ohio.
Electric Furnace Co., Salem, Ohio.
Harper Electric Furnace Corp., Buffalo, N. Y.
Holden, A. F., Co., The, Detroit, Mich.
Rockwell, W. S. Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Pot (oil, gas, electric)
Ajax Electric Co., Inc., Philadelphia, Pa.
Holden, A. F., Co., The, Detroit, Mich.

FURNACES—Resistance Heating, Strand
Trauwood Engineering Co., The, Cleveland, Ohio.

FURNACES—Salt Bath
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio.
Holden, A. F. Co., The, Detroit, Mich.
Rockwell, W. S. Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Wire, Strip & Sheet
Carl-Mayer Corp., The, Cleveland, Ohio.
Eisler Engineering Co., Newark, N. J.
Electric Furnace Co., Salem, Ohio.
Harper Electric Furnace Corp., Buffalo, N. Y.
Morrison Industries, Bedford, Ohio.
Rockwell, W. S. Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engineering Co., The, Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio
Westinghouse Electric Corp., Industri l Heating Div., Meadville, Pa.

GALVANIZING EQUIPMENT—
Steel Equipment Co., Cleveland, Ohio.
Wean Equipment Corp., Cleveland, Ohio.

GRINDERS—Roll
Norton Co., The, Worcester, Mass.

HAMMERS—Swaging
Sjogren Tool and Machine Co., Auburn, Mass.

HOOKS—Pickling & Liming
Bronze Die Casting Co., Pittsburgh, Pa.

HOISTS—Electric Travelling
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, Ohio.

IMPREGNATING MATERIALS—
Standard Toch Chemicals, Inc., New York N. Y.

INHIBITORS—Pickling
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Parkin Chemical Company, The, Pittsburgh, Pa.
Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

INSULATING LACQUERING SYSTEMS—Continuous
American Insulating Machine Co., Phila., Pa.
Industrial Ovens, Inc., Cleveland, Ohio.

INSULATING MATERIALS—
Glass Fibers, Inc., Toledo, Ohio
Merrimac Paper Co., New York, N. Y.
New England Lacquer Co., E. Providence, R. I.
Owens Corning Fiberglas Corp., Toledo, O.
Sol r Compounds Corporation, Linden, N. J.
Standard-Toch Chemicals, Inc., New York, N. Y.

INSULATING MATERIALS—Paper—For Electric Wire Cable.
Merrimac Paper Co., New York, N. Y.
Sol r Compounds Corporation, Linden, N. J.

LACQUERS—For Electric Wire
New England Lacquer Co., E. Providence, R. I.
Sol r Compounds Corporation, Linden, N. J.
Standard-Toch Chemicals, Inc., New York, N. Y.

LAME—LAHN—
Montgomery Co., The, Windsor Locks, Conn.

LATHES—Die Reaming
Carboloy Dept. of General Electric Co., Detroit, Mich.
Roos, Tool & Mfg. Div., Dykrex Corp., Newark, N. J.

LIME—
Warner Co., Philadelphia and Bellefonte, Pa.

LININGS—Acid and Alkali Proof
Heil Process Equipment Corp., Cleveland, Ohio

LUBRICANTS — For Metal Cutting, Stamping and Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Nopco Chemical Co., Harrison, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

LUBRICANTS—Wire Drawing
(See Compounds—Wire Drawing)

LUBRICANTS—Wire Rope
Swift & Co., Chicago, Ill.

LUMBER—Wire Mill, Carload shipments for lagging and car blocking
North Anson Reel Co., No. Anson, Me.

MACHINERY—Armoring (Cable, Wire Hose)
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Barbed Wire
Glader Machine Works, Chicago, Ill.
Kayser, J. G. Machinenfabrik, Nurnberg, Germany
Wafios, Maschinenfabrik, Reutlingen, Germany
Wean Engineering Co., Cleveland, Ohio.

MACHINERY—Bead Wrapping
Terkelsen Machine Co., Boston, Mass.

MACHINERY—Bolts & Rivets
Meyer, Roth & Pastor Maschinenfabrik, Koln-Raderberg, Germany

MACHINERY—Braiding
Fidelity Machine Co., Inc., Philadelphia, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Wardwell Braiding Machine Co., Central Falls, R. I.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R.I.

MACHINERY—Brazing
Eisler Engineering Co., Newark, N. J.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Bunching
American Insulating Mach'y Co., Phila., Pa.
Cook Manufacturing Co., The, Paterson, N. J.
Federal Manufacturing Co., Wallingford, Conn.
Haskell-Dawes Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R.I.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Cable, Electric
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Inc., Philadelphia, Pa.
Haskell-Dawes Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.

WHERE TO BUY, Continued

Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cable, Rope Closing
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Capstans
(See Machinery—Wind-Up)

MACHINERY—Chain Making
Meyer, Roth & Pastor Maschinenfabrik, Koln-Radderberg, Germany
Nilson, A. H., Machine Co., Bridgeport, Conn.

MACHINERY—Coilers
Boyd & Sons Manufacturing Corp., Philadelphia, Pa.
Eisler Engineering Co., Newark, N. J.
Entwistle, Jas. L. Co., Providence, R. I.
Morgan Construction Co., Worcester, Mass.
National Machy. Exch. (used) New York, N. Y.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio
Wire & Textile Mach'y, Inc. (used) Pawtucket, R.I.

MACHINERY—Cold Heading
(See Cold Headers)

MACHINERY—Copper Wire Drawing and Rolling
Aetna-Standard Engineering Co., Youngstown, Ohio
American Insulating Mach'y Co., Phila., Pa.
Fenn Manufacturing Co., The, Hartford, Conn.
National Mach'y Exch. (Used), New York, N. Y.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Covering Wire
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Inc., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Nilson, A. H., Machine Co., Bridgeport, Conn.
Royle, John & Sons, Paterson, N. J.
Standard Machinery Co., Mystic, Conn.
Syncro Machine Co., Perth Amboy, N. J.
Wardwell Braiding Machine Co., Central Falls, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cutting
Eisler Engineering Co., Newark, N. J.
Lewis Machine Co., The, Cleveland, Ohio
Medart Company, The, St. Louis, Mo.
Mettler Machine Tool, Inc., New Haven, Conn.
National Mach'y Exch. (Used) New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Wean Equipment Corp., Cleveland, Ohio

MACHINERY—Die Making
Carboloy Dept. General Electric Co., Detroit, Mich.
Firth Sterling Steel & Carbide Corp., Pittsburgh, Pa.
Kelly Wire Die Corp., New York, N. Y.
Roos Tool & Mfg. Div., Dykrex Corp., Newark, N. J.
Wayne Wire Die Co., Hillside, N. J.

MACHINERY—Dielectric Spark Testers
(See Machinery—Spark Testing)

MACHINERY—Draw Benches
Aetna-Standard Engineering Co., Youngstown, Ohio
Morgan Construction Co., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Warterweiler, Emilio, Milano, Italy
Wean Equipment Corp., Cleveland, Ohio

MACHINERY—Edging
Wean Equipment Corp., Cleveland. Ohio

MACHINERY—Electrode Units
(See Machinery—Spark Testing)

MACHINERY—Enameling
American Insulating Mach'y Co., Phila., Pa.
Cook Manufacturing Co., The, Paterson, N. J.
Industrial Ovens, Inc., Cleveland, Ohio
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Extruding
National Rubber Machinery Co., Akron, Ohio
Royle, John, & Sons, Paterson, N. J.
Standard Machinery Co., Mystic, Conn.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R.I.

MACHINERY—Fence
Glader, Wm., Machine Works, Chicago, Ill.
Interlocking Fence Co., Morton, Ill.
Wafios, Maschinenfabrik, Reutlinger, Germany
Wean Equipment Corp., Cleveland, Ohio

MACHINERY—Filament Coil Winding
Eisler Engineering Co., Newark, N. J.

MACHINERY—Flat Wire
Fenn Manufacturing Co., The, Hartford, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Stanat Manufacturer Co., Long Island City, N. Y.
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, Ohio

MACHINERY—Forming Wire
Kayser, J. G., Maschinenfabrik, Nurnberg, Germany
Nilson, A. H., Machine Co., Bridgeport, Conn.

MACHINERY—Galvanizing
(See Galvanizing Equipment)

MACHINERY—Galvanizing Wire
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, O.
Wilson, Lee, Engr. Co., Cleveland, Ohio

MACHINERY—Gang Winders
Entwistle, Jas. L. Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., The, Worcester, Mass.

MACHINERY—Insulating
American Insulating Mach'y Co., Phila., Pa.
Ets. Pourtier Frères, Romainville, France
Fidelity Machine Co., Inc., Philadelphia, Pa.
National Rubber Machinery Co., Akron, Ohio
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Knitting
Fidelity Machine Co., Inc., Philadelphia, Pa.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Looms, Wire Weaving
Interlocking Fence Co., Morton, Ill.
Wartenweiler, Emilio, Milano, Italy

MACHINERY—Magnet Wire
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Material Handling
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

MACHINERY—Measuring Wire & Cable
Davis Electric Co., Wallingford, Conn.
Durant Mfg. Co., Milwaukee, Wis.
Entwistle, Jas. L. Co., Providence, R. I.
New England Butt Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack
Baird Machine Co., The, Stratford, Conn.
Glader, Wm., Machine Works, Chicago, Ill.
Kayser, J. G., Maschinenfabrik, Nurnberg, Germany
Meyer, Roth & Pastor Maschinenfabrik, Koln-Radderberg, Germany
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Wafios, Maschinenfabrik, Reutlinger, Germany
Wean Equipment Corp., Cleveland, Ohio

MACHINERY—Panning
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Perth Amboy, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R.I.

MACHINERY—Pickling
Chemsteel Construction Co., Pittsburgh, Pa.

MACHINERY—Pin Making
Baird Machine Co., The, Stratford, Conn.
Meyer, Roth & Pastor Maschinenfabrik, Koln-Radderberg, Germany

MACHINERY—Pointing
Aetna-Standard Engineering Co., Youngstown, Ohio
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N. Y.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio

MACHINERY—Poultry Wire Fencing
Interlocking Fence Co., Morton, Ill.

MACHINERY—Pre-Heater for Wire (for Extrusion of Plastics)
Industrial Ovens, Inc., Cleveland, Ohio
National Rubber Machinery Co., Akron, Ohio

MACHINERY—Re-Spoolers
American Insulating Mach'y Co., Phila., Pa.
Boyd & Sons Manufacturing Corp., Philadelphia, Pa.
Davis Electric Co., Wallingford, Conn.
Eisler Engineering Co., Newark, N. J.
Emory, Robert J., Co., Newark, N. J.
Entwistle, Jas. L. Co., Providence, R. I.
Fidelity Machine Co., Inc., Philadelphia, Pa.
National Mach'y Exch. (Used), New York, N. Y.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio
Wire & Textile Mach'y, Inc. (used) Pawtucket, R.I.

MACHINERY—Rod Mill
Morgan Construction Co., Worcester, Mass.
Wean Equipment Corp., Cleveland, Ohio

MACHINERY—Rolling Mill
Morgan Construction Co., Worcester, Mass.
National Machy. Exch. (used) New York, N. Y.
Stanat Manufacturer Co., Long Island City, N. Y.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Wean Engineering Co., Cleveland, Ohio

MACHINERY—Rubber Insulating
National Rubber Machinery Co., Akron, Ohio
Royle, John & Sons, Paterson, N. J.
Standard Machinery Co., Mystic, Conn.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R.I.

MACHINERY—Rubber Tubing and Straining
National Rubber Machinery Co., Akron, Ohio
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Mystic, Conn.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R.I.

MACHINERY—Screw Making
Kayser, J. G., Maschinenfabrik, Nurnberg, Germany

MACHINERY—Screw Wire
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Spark Testing
Davis Electric Co., Wallingford, Conn.
Entwistle, Jas. L. Co., Providence, R. I.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R.I.

MACHINERY—Special
American Insulating Mach'y Co., Phila., Pa.
Cook Manufacturing Co., The, Paterson, N. J.
Emory, Robert J., Co., Newark, N. J.
Entwistle, Jas. L. Co., Providence, R. I.
New England Butt Co., Providence, R. I.
Nilson, A. H., Machine Co., Bridgeport, Conn.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Siogren Tool and Machine Co., Auburn, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Stanat Manufacturer Co., Long Island City, N. Y.
Standard Machinery Co., Mystic, Conn.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio

MACHINERY—Spring Making
Carlson Company, The, New York, N. Y.
Lundahl Corp., Hartford, Conn.
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wafios, Maschinenfabrik, Reutlinger, Germany
Wells, Frank L., Co., Kenosha, Wisc.

MACHINERY—Staple
Kayser, J. G., Maschinenfabrik, Nurnberg, Germany
Sleeper & Hartley, Inc., Worcester, Mass.
Wafios, Maschinenfabrik, Reutlinger, Germany

MACHINERY—Straightening & Cutting
Fenn Manufacturing Co., The, Hartford, Conn.
Kayser, J. G., Maschinenfabrik, Nurnberg, Germany
Lewis Machine Co., The, Cleveland, Ohio
Medart Company, The, St. Louis, Mo.
Mettler Machine Tool Co., New Haven, Conn.
Meyer, Roth & Pastor Maschinenfabrik, Koln-Radderberg, Germany
National Mach'y Exch. (Used), New York, N. Y.
Nors-Hohm Machine Div. of Nors-Hohm Industries, Inc., Rochester, Michigan
Sleeper & Hartley, Inc., Worcester, Mass.
Wartenweiler, Emilio, Milano, Italy
Wean Equipment Corp., Cleveland, Ohio
Wells, Frank L., Co., Kenosha, Wisc.

MACHINERY—Stranding
Haskell-Dawes Machine Co., Philadelphia, Pa.
Hughesville Machine & Tool Co., Hughesville, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Strip Steel
Aetna-Standard Engineering Co., Youngstown, Ohio
Steel Equipment Co., Cleveland, Ohio
Wean Equipment Corp., Cleveland, Ohio

MACHINERY—Swaging
Fenn Manufacturing Co., The, Hartford, Conn.
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

WHERE TO BUY, Continued

MACHINERY—Take-Up and Pay-Out Systems
Aetna-Standard Engineering Co., Youngstown, Ohio
Davis Electric Co., Wallingford, Conn.
Federal Manufacturing Co., Wallingford, Conn.
Industrial Ovens, Inc., Cleveland, Ohio
Marshall-Richards Machine Co., Inc., Trenton, N.J.
Standard Machinery Co., Mystic, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Taping
American Insulating Mach'y Co., Phila., Pa.
Ets. Pourtier Frères, Romainville, France
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R.I.

MACHINERY—Testing, Physical
Lundahl Corporation, Hartford, Conn.
Scott Testers, Inc., Providence, R. I.

MACHINERY—Tinning Wire
American Insulating Mach'y Co., Phila., Pa.
Cook Manufacturing Co., The, Paterson, N. J.
New England Butt Co., Providence, R. I.
Steel Equipment Co., Cleveland, Ohio.
Syncro Machine Co., Perth Amboy, N. J.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Trolley Wire
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill
Marshall-Richards Machine Company, Inc., Trenton, N. J.

MACHINERY—Twinning
(See Mach.—Bunching)

MACHINERY—Twisters, Wire
Cook Manufacturing Co., The, Paterson, N. J.
Davis Electric Co., Wallingford, Conn.
Federal Manufacturing Co., Wallingford, Conn.

MACHINERY—Welding Wire
Eisler Engineering Co., Newark, N. J.
Micro Products Co., Chicago, Ill.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Winding
American Insulating Mach'y Co., Phila., Pa.
Eisler Engineering Co., Newark, N. J.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Mill Supply, Pawtucket, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Winding Wire
Federal Manufacturing Co., Wallingford, Conn.
Standard Mill Supply, Pawtucket, R. I.

MACHINERY—Wire Bending
Eisler Engineering Co., Newark, N. J.
Kilmer, M. D., & Co., Cleveland, Ohio.

MACHINERY—Wire Drawing
Aetna-Standard Engineering Co., Youngstown, Ohio
American Insulating Mach'y Co., Phila., Pa.
Cook Manufacturing Co., The, Paterson, N. J.
Fenn Manufacturing Co., The, Hartford, Conn.
Kurt Orban Co., Inc., New York, N. Y.
Marshall-Richards Machine Co., Inc., Trenton, N.J.
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N. Y.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Wire Forming
Baird Machine Co., The, Stratford, Conn.
Kilmer, M. D. & Co., Cleveland, Ohio.
Meyer, Roth & Pastor Maschinenfabrik, Koln-Radderberg, Germany
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Wafios, Maschinenfabrik, Reutlinger, Germany

MACHINERY—Wire Rope
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wood Screw
National Mach'y Exch. (Used), New York, N. Y.

MACHINERY—Wrapping Straight Lengths and Tubing
Angier Corporation, The, Framingham, Mass.
Terkelsen Machine Co., Boston, Mass.

MACHINERY—Wrapping Wire Coils
Angier Corporation, The, Framingham, Mass.
Terkelsen Machine Co., Boston, Mass.

MATERIAL HANDLING EQUIPMENT—
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

MILLS—Tandem, Rolling & Edging
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Co., Cleveland, Ohio.

NAILS—Wire
American Steel & Wire Co., Cleveland, Chicago, New York.
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling, John A. Sons Co., Trenton, N. J.
Wickwire Brothers, Inc, Cortland, N. Y.

OVENS—Cable Lacquering
American Insulating Mach'y Co., Phila., Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.
Morrison Industries, Bedford, Ohio
Westinghouse Electric Corp., Industrial Heating Div., Meadville, Pa.

OVENS—Dehydrogenizing
Industrial Ovens, Inc., Cleveland, Ohio.

OVENS—Industrial
Industrial Ovens, Inc., Cleveland, Ohio.

OVENS—Rod Bakers
Carl-Mayer Corp., The, Cleveland, Ohio.
Morrison Industries, Bedford, Ohio

OVENS—Welding Rod Coating
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.
Morrison Industries, Bedford, Ohio

PAINT—Acid Proof
Ceilcote Company, Cleveland, Ohio.
Standard-Toch Chemicals, Inc., New York, N. Y.

PAINT BONDING CHEMICALS—
American Chemical Paint Co., Ambler, Pa.

PAINTS—Heat Resisting
American Chemical Paint Co., Ambler, Pa.
Standard-Toch Chemicals, Inc., New York, N. Y.

PANS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

PAPER—Creped Wrapping
Angier Corporation, The, Framingham, Mass.
Arkell Safety Bag Co., New York, N. Y.
Crepe-Kraft Company, The, Division National Waterproof Papers, Inc., Newark, N. J.
Terkelsen Machine Co., Boston, Mass.

PAPER—For Coil Wrapping and Corrosion Prevention
Angier Corporation, The, Framingham, Mass.
Arkell Safety Bag Co., New York, N. Y.
Crepe-Kraft Company, The, Division National Waterproof Papers, Inc., Newark, N. J.
Terkelsen Machine Co., Boston, Mass.

PATENT ATTORNEYS—
Lancaster, Allwine & Rommel, Washington, D. C.

PAY-OUT SYSTEMS—
(See Wind-up and Unwind Systems)

PHOSPHATE COATING CHEMICALS—
American Chemical Paint Co., Ambler, Pa.

PICKLING COMPOUNDS—
See (Inhibitors—Pickling)

PICKLING—Hooks, etc. Acid Resisting
Bronze Die Casting Co., Pittsburgh, Pa.

PICKLING TANK LININGS—
Chemsteel Construction Co., Pittsburgh, Pa.
Heil Process Equipment Corp., Cleveland, Ohio.

PIPES & FITTINGS—Acid Resistant
Heil Process Equipment Corp., Cleveland, Ohio.

PLASTIC TESTERS—
Scott Testers, Inc., Providence, R. I.

PNEUMATIC CYLINDERS—
Entwistle, Jas. L. Co., Providence, R. I.

POTS—Lacquer
Industrial Ovens, Inc., Cleveland, Ohio.

PRESSES—Hydraulic and Mechanical
Standard Machinery Co., Mystic, Conn.

PULLERS AND GRIPS—For Wire
Morgan Construction Co., Worcester, Mass.
Scudder, E. J. Fdry & Mach. Co., Trenton, N. J.
Sjogren Tool and Machine Co., Auburn, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.

REEL AND TENSION STANDS—
Davis Electric Co., Wallingford, Conn.
Entwistle, Jas. L. Co., Providence, R. I.
Industrial Ovens, Inc., Cleveland, Ohio.
Roll-a-Reel, Cincinnati, Ohio.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Mill Supply Co., Pawtucket, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

REEL CRUTCHES—
Roll-a-Reel, Cincinnati, Ohio
Watson Machine Co., Paterson, N. J.

REELS & SPOOLS—Drawn Aluminum Alloy
Acrometal Products, Inc., Minneapolis, Minn.
Hubbard Spool Co., Garrett, Indiana

REELS & SPOOLS—Annealing and Stranding
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Co., Garrett, Indiana
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp. Niles, Ohio.

REELS & SPOOLS—Collapsible
Entwistle, Jas. L. Co., Providence, R. I.

REELS & SPOOLS—Plastic
Hubbard Spool Co., Garrett, Indiana

REELS & SPOOLS—Steel
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Clark, J. L., Mfg. Co., Rockford, Ill.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Co., Garrett, Indiana
Mason Can Company, East Providence, R. I.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp Niles, Ohio.

REELS AND SPOOLS—Shipping and Shop
Acrometal Products, Inc., Minneapolis, Minn.
American Woodworking Co., Chicago, Ill.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg. Co., Inc., The, Hazardville, Conn.
Clark, J. L., Mfg. Co., Rockford, Ill.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Co., Garrett, Indiana
Mason Can Company, East Providence, R. I.
McCaskie, Inc., Wm., Westport, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp Niles, Ohio.
North Anson Reel Co., No. Anson, Me.

REELS & SPOOLS—Wooden
Acrometal Products, Inc., Minneapolis, Minn.
American Woodworking Co., Chicago Ill.
Bridge Mfg. Co., Inc., The, Hazardville, Conn.
Durkee Mfg. Co., Pine River, Minn.
North Anson Reel Co., No. Anson, Me.
No. Waterford Spool Co., No. Waterford, Me.

REELS—Metal Bound
Durkee Mfg. Co., Pine River, Minn.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Co., Garrett, Indiana
McCaskie, Inc., Wm., Westport, Mass.
North Anson Reel Co., No. Anson, Me.

REELS—Pay-off
Nors-Holm Industries, Rochester, Mich.

REELS—Takeoff
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg. Co., The, Hazardville, Conn.
Clark, J. L., Mfg. Co., Rockford, Ill.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Co., Garrett, Indiana
McCaskie, Inc., Wm., Westport, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp Niles, Ohio.
North Anson Reel Co., No. Anson, Me.

REELS—Vulcanizing & Impregnating
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Co., Garrett, Indiana
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio

REELS—Wire Drawing
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Co., Garrett, Indiana
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

WHERE TO BUY, Continued

REELS—Wire Mill
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg. Co., The, Hazardville, Conn.
Durkee Mfg. Co., Pine River, Minn.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Garrett, Indiana
Mason Can Company, East Providence, R. I.
McCaskie, Inc., Wm., Westport, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp. Niles, Ohio.
North Anson Reel Co., No. Anson, Me.

REFRACTORIES—High Temperature
Norton Company, Worcester, Mass.

RESISTANCE HEATING—Annealing Patenting, Etc.
Trauwood Engr. Co., Cleveland, Ohio.

ROD BAKERS—
(See Ovens—Rod Bakers)

RODS—Stainless Steel
American Steel & Wire Co., Cleveland, Ohio.
U. S. Steel Co., N. Y., N. Y.

RODS—Wire—Non-Ferrous
American Brass Co., The, Waterbury, Conn.
Platt Bros. & Co., The, Waterbury, Conn.

RODS—Wire, Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Erie Iron & Supply Corp., Erie, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Montan Export, Inc., New York, N. Y.
Pittsburgh Steel Company, Pittsburgh, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

ROPE—Wire
American Steel & Wire Company, Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Roebling's John A., Sons Co., Trenton, N. J.

RUBBER AND RUBBER COMPRESSION TESTERS—
Scott Testers, Inc., Providence, R. I.

RUST PROOF COMPOUNDS—
(See Compounds—Rust Preventing)

RUST REMOVING COMPOUNDS—
(See Compounds—Rust Preventing)

SALTS—Heat Treating, Descaling, etc.
Holden, A. F., Co., The, Detroit, Mich.

SATURATION SYSTEMS—
Industrial Ovens, Inc., Cleveland, Ohio.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R.I.

SOAPS—Industrial and Wire Drawing
(See Compounds—Wire Drawing)

SODIUM—for Descaling
Holden, A. F., Co., The, Detroit, Mich.

SOLVENT RESIN SYSTEMS—Experimental
Industrial Ovens, Inc., Cleveland, Ohio.

SPOOLS—(See Reels & Spools)

SPOOLS—Stamped Metal for Retail Wire Sales
Clark, J. L. Mfg. Co., Rockford, Ill.
Mason Can Co., East Providence, R. I.

STAMPINGS—Steel
Acrometal Products, Inc., Minneapolis, Minn.
Hubbard Spool Company, Garrett, Indiana
Mossberg Pressed Steel Corp., Attleboro, Mass.

STRIP—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Roebling's John A., Sons Co., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

SWIFTS—Take-off
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Watson Machine Co., Paterson, N. J.

TANKS—Compound
Watson Machine Co., Paterson, N. J.

TANKS—Pickling
Ceilcote Company, Cleveland, Ohio.
Chemsteel Construction Co., Pittsburgh, Pa.

TANKS—Steel
Chemsteel Construction Co., Pittsburgh, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.

TINNING PROCESS—
Metal & Thermit Corp., New York, N. Y.

TINSEL—Cords, Decorative
(See: Tinsel—Electric Conductor)

TINSEL—Electric Conductor
Montgomery Co., The, Windsor Locks, Conn.

TINSEL—Electric Resistance
(See: Tinsel—Electric Conductor)

TINSEL—Lame, Silver and False Gold
(See: Tinsel—Electric Conductor)

TINSEL—Thread, Silver and False Gold
(See: Tinsel—Electric Conductor)

TINSEL—Thread, Decorative
(See: Tinsel—Electric Conductor)

TINSEL—Wire
(See: Tinsel—Electric Conductor)

TOOLS—Spring Forming
Lundahl Corporation, Hartford, Conn.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

TRAVERSES & DRUMS—For Reels
(See Drums & Traverses)

TRAVERSE MECHANISMS—
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Niles Steel Products Div., Republic Steel Corp. Niles, Ohio
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R.I.

TUBE BENDERS AND FORMERS—
H. D. Kilmer Co., Cleveland, Ohio.

TURKS HEADS—
Fenn Manufacturing Co., The, Hartford, Conn.

VARNISHES—for Electric Wire
N. E. Lacquer Co., E. Providence, R. I.
Solar Varnish Corpor tion, Linden, N. J.
Standard-Toch Chemicals, Inc., New York, N. Y.

VULCANIZERS—
Watson Machine Co., Paterson, N. J.

VULCANIZING PANS—
American Insulating Mach'y Co., Phila., Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.

WELDERS—Spot and Butt
Eisler Engineering Co., Newark, N. J.
Micro Products Co., Chicago, Ill.

WIND-UP AND UNWIND SYSTEMS—Continuous
American Insulating Mach'y Co., Phila., Pa.
Davis Electric Co., Wallingford, Conn.
Entwistle, Jas. L. Co., Providence, R. I.
Federal Manufacturing Co., Wallingford, Conn.
Industrial Ovens, Inc., Cleveland, Ohio
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R.I.

WIRE—Alloy
Montan Export, Inc., New York, N. Y.

WIRE—Aluminum
Elmet Division, North American Philips Company, Inc., Lewistown, Maine
Malin & Co., Cleveland, Ohio
Seneca Wire & Manufacturing Co., Fostoria, Ohio

WIRE—Barbed
Interlocking Fence Co., Morton, Ill.

WIRE—Cast
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Cold Heading
American Steel & Wire Co., Cleveland, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Erie Iron & Supply Corp., Erie, Pa.
Gerber, J., & Co., Inc., New York, N. Y.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's John A., Sons Co., Trenton, N. J.
Seneca Wire & Manufacturing Co., Fostoria, Ohio
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Coppered
Gerber, J., & Co., Inc., New York, N. Y.

WIRE—Electric
American Brass Co., The, Waterbury, Conn.
Chase Brass & Copper Co., Waterbury, Conn.
Malin & Co., Cleveland, Ohio

WIRE—Flat, Fine
Elmet Division, North American Philips Company, Inc., Lewistown, Maine
Montgomery Co., The, Windsor Locks, Conn.

WIRE—Galvanized
Gerber, J., & Co., Inc., New York, N. Y.

WIRE—Manufacturers
American Steel & Wire Co., Cleveland, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Chase Brass & Copper Co., Waterbury, Conn.
Continental Steel Corp., Kokomo, Ind.
Gerber, J., & Co., Inc., New York, N. Y.
Johnson Steel & Wire Co., Worcester, Mass.
Keystone Steel & Wire Co., Peoria, Ill.
Montan Export, Inc., New York, N. Y.
Newbury Company, The, Boston, Mass.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Manufacturing Co., Fostoria, Ohio
U. S. Steel Co., N. Y., N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Music
American Brass Co., The, Waterbury, Conn.
American Steel & Wire Co., Cleveland, Ohio
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Malin & Co., Cleveland, Ohio
Montan Export, Inc., New York, N. Y.
Newbury Company, The, Boston, Mass.
Seneca Wire & Manufacturing Co., Fostoria, Ohio
Specialty Wire Co., Inc., Worcester, Mass.

WIRE—Nickel Silver and Phosphor Bronze
American Brass Co., The, Waterbury, Conn.
Malin & Co., Cleveland, Ohio.
Chase Brass & Copper Co., Waterbury, Conn.

WIRE—Non-Ferrous to Specifications for Special Purposes
American Brass Co., The, Waterbury, Conn.
American Steel & Wire Co., Cleveland, Ohio
Chase Brass & Copper Co., Waterbury, Conn.
North American Philips Co., Inc., Allied Products Division, New York, N. Y.

WIRE—Oil Tempered
Pittsburgh Steel Co., Pittsburgh, Pa.

WIRE—Spring
American Brass Co., The, Waterbury, Conn.
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Keystone Steel & Wire Co., Peoria, Ill.
Newbury Company, The, Boston, Mass.
Pittsburgh Steel Co., Pittsburgh, Pa.
Seneca Wire & Manufacturing Co., Fostoria, Ohio
Specialty Wire Co., Inc., Worcester, Mass.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Stainless Steel
American Steel & Wire Co., Cleveland, Ohio
Firth Sterling Steel & Carbide Co., Pittsburgh, Pa.
Specialty Wire Co., Inc., Worcester, Mass.

WIRE—Steel—Also Coppered and Galvanized Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Erie Iron & Supply Corp., Erie, Pa.
Gerber, J., & Co., Inc., New York, N. Y.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Seneca Wire & Manufacturing Co., Fostoria, Ohio
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Straightening and Cutting
Erie Iron & Supply Corp., Erie, Pa.
Pittsburgh Cut Wire Co., Pittsburgh, Pa.
Wickwire Brothers, Inc., Cortland, N. Y.

WIRE—Tungsten
North American Philips Co., Inc., Allied Products Division, New York, N. Y.

WIRE—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

WIRE CLOTH—Industrial
Roebling's, John A., Sons Co., Trenton, N. J.
Wickwire Brothers, Inc., Cortland, N. Y.

WIRE—Weaving (Non-Ferrous)
American Brass Co., The, Waterbury, Conn.
Chase Brass & Copper Co., Waterbury, Conn.

WRAPPING PAPER—Creped
Angier Corporation, The, Framingham, Mass.
Arkell Safety Bag Co., New York, N. Y.
Crepe-Kraft Company, The, Division National Waterproof Papers, Inc., Newark, N. J.

YARNS & TAPES—
Glass Fibers, Inc., Toledo, Ohio
Owens Corning Fiberglas Corp., Toledo, Ohio.

YARN TESTERS—
Scott Testers, Inc., Providence, R. I.

The WATSON MACHINE COMPANY

ESTABLISHED 1845

PATERSON 3, NEW JERSEY, U. S. A.

ELECTRICAL WIRE AND CABLE, WIRE ROPE, CORDAGE AND MASTICATING MACHINERY MANUFACTURERS

WATSON

PLANETARY STRANDERS: Three types, many sizes, for all duties, geared or ring backturn, main rotor shaft or roller support. "Shaftless" cradles.

RIGID FRAME STRANDERS "RH." Horizontal, overhung spindle designs. Ball bearing main rotor shaft support, no support rollers.

TUBULAR STRANDERS "TH." High speed type in all sizes. Patented Boat cradles and Tungsten Carbide guide system. Rotor spool and lay head electric stops.

TUBULAR STRANDERS "VL"—New design, safe extra high speeds. Quick loading. "Shaftless" no loose parts cradles.

CABLERS.

Planetary and high speed "HH" designs.

CLOSERS.

Planetary and high speed types for wire rope.

WATSON

BUNCHERS:

VERTICAL
Minimum Floor Space
Double-Twist
Types
"V-7"
250 # Cap.
V-10
500 & 1000 # Cap.

ARMORING MACHINES. Complete with planetary wire or metal tape heads.

JUTERS. 36 or 48 cop and to 6-inch cable passage.

SERVING HEADS. Concentric and eccentric, many designs, for threads, asbestos, etc.

TAPING HEADS. Many types and sizes. For metallic and non-metallic tapes. Eccentric, single and double-concentric. Patented uniform torque tape brake.

COMPOUNDING AND SATURATING TANKS. Many types and sizes.

CHALK, MICA AND OTHER POWDER APPLIERS. "Wet and Dry" types in a variety of designs and sizes.

CAPSTAN SECTIONS. Single tapered wheels to 10 foot dia. and double grooved types to 80 inch dia. for heaviest duty and highest haul pulls. Many sizes and designs.

LET-OFFS. Manual, mechanical, hydraulic, and electric motor lift types and "Shaftless" designs to 120-inch 30-ton sizes.

GANG SPOOLERS. Table and Floor types in many sizes and designs.

REWINDERS AND COILERS. All motorized, for warehouse and shipping use.

CAPSTAN TAKEUPS. Single and in multiples.

CONTINUOUS TAKEUPS. Double reel designs, constant tension, wide speed range to cover all Continuous Vulcanizing and plastic Extruding takeup requirements.

HEAVY DUTY TAKEUPS. "Shaftless" in many designs and sizes to 120"-50-ton. Mechanical lift, hydraulic lift, motorized lift, incline frame, and other types. Line shaft, electric, and hydraulic drives. Foot treadle, electric switch, pneumatic, hydraulic, and mechanical controls.

TAKEUP TRANSMISSIONS. Heavy Duty, Type "D." Combines two-speed transmission, manual slack-takeup drive, and multiple-disc-in-oil friction mechanism in one compact unit. Now available in three sizes.

AUTOMATIC TRAVERSES. Many sizes and arrangements. Wide lay range. Designs cover range from fine wire to 6" cable and wire rope. Fully automatic and disconnectible for manual operation. Suitable and widely used for replacement of inadequate mechanism on older takeups.

VULCANIZERS. Cavity and Plate "Patch" units. Mechanically or pneumatically operated. Available with or without dies.

POLISHERS. Power driven, centrifugal and spring-pressure types.

TESTING MACHINES. Impact, Torsion, Bend and Endurance types.

MEASURING MACHINES. For linear measurement. Offered in a variety of sizes and arrangements.

REEL CRUTCHES. For turning very large and heavy reels. Widely used in warehouses, shipping rooms, by railroads, steamship lines and wherever reel handling is a problem. Available from stock.

REELS AND SPOOLS. Cast Steel and Fabricated designs for extremely heavy planetary and shipping use.

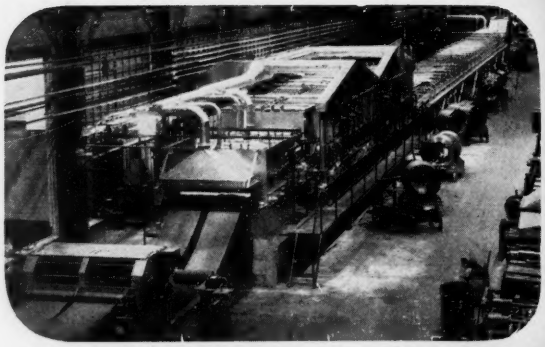
CABLE PLANT AND WIRE ROPE MILL EQUIPMENT. All manners of special and miscellaneous designs for general and special purpose work too numerous for listing but on which inquiries are invited.

Galvanizing

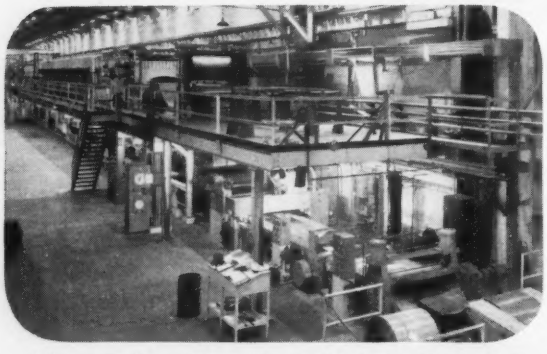
Aluminizing

Bright Annealing and

Normalizing Strip ------ Continuously



Strip in single or multiple strands up to a total width of 54" may be bright annealed or normalized, continuously, in this EF gas fired radiant tube installation. Capacity 7200 lbs. per hour.



A large capacity continuous strip normalizing, annealing and galvanizing unit. This is a combination EF gas fired radiant tube and electrically heated installation and is over 400 feet long.

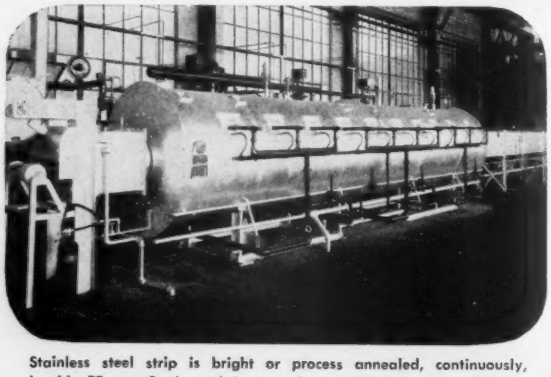
We are in position to design, build and put in operation; continuous strip lines for hot or cold rolled, high or low carbon, stainless, silicon, tinplate, aluminum, brass, bronze or any other ferrous or non-ferrous strip — for bright annealing, normalizing, galvanizing, aluminizing, tinning or any other process — in the size and type best suited to your plant, process, product or production requirements. No job is too large or too unusual.

Put your production furnace problems up to experienced engineers — *it pays*.

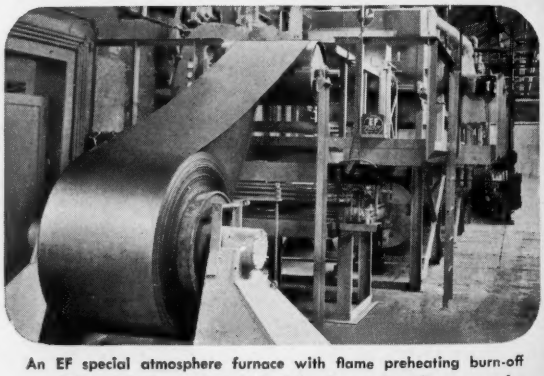
THE ELECTRIC FURNACE CO.

Salem, Ohio

Gas Fired, Oil Fired and Electric Furnaces



Stainless steel strip is bright or process annealed, continuously, in this EF gas fired special atmosphere tube muffle type furnace. It also handles other strip requiring lower temperatures.



An EF special atmosphere furnace with flame preheating burn-off or oxidizing section and controlled heating and cooling zones for producing various surface conditions on strip.